Département Amélioration des Méthodes pour l'Innovation Scientifique
Cirad-amis

RAPPORT DE MISSION AUX ETATS-UNIS

du 09/05/98 au 18/05/98

PARTICIPATION AU 89th CONGRES DE L'AMERICAN OIL CHEMIST'S SOCIETY - Chicago

COOPERATION AVEC L'US DEPARTMENT OF AGRICULTURE NATIONAL CENTER FOR AGRICULTURAL UTILIZATION RESEARCH - Peoria Illinois

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RESUME

Le programme proposé à B. Charpentier, Attaché Coopération Scientifique au Consulat de France (participation très active au congrès de l'AOCS ; visite au NCAUR) ainsi que les objectifs, participation française plus étoffée et poursuite de la collaboration, vont dans le sens d'une présence accrue de notre communauté scientifique.

Participation au congrès annuel de l'American Oil Chemists' Society (AOCS)

L'AOCS, la plus importante association dans le domaine des lipides, constitue donc un lieu d'échanges particulièrement privilégié. La création de la division "Industrial Oil Products" à laquelle j'ai contribué a conduit à organiser cinq sessions (60 communications) dont l'une d'elle m'a été confiée. La présence de 6 orateurs français (dont J-P. Gaouyer, Responsable pour les utilisations non alimentaires à l'ADEME), effet direct de cette implication dans l'organisation, a favorisé les échanges entre les deux communautés scientifiques. Au total la participation française a été doublée par rapport au précédent congrès.

Les deux communications scientifiques données ont permis pour l'une d'afficher la collaboration du CIRAD avec le PORIM (Malaisie) et d'identifier des industriels intéressés, pour l'autre d'asseoir la position de l'équipe PCBM du Programme Agro-Alimentaire (PAA) du CIRAD-AMIS associée aux américains, dans un domaine où peu de travaux sont entrepris en raison de la difficulté. La discussion avec un groupe philippin (collaboration en lipochimie) a pu être poursuivie et des contacts intéressants ont aussi été pris dans le domaine des procédés membranaires avec des industriels ainsi qu'avec ATO-DLO (organisme de recherche hollandais; projet de visite avec A-L. Wack, Chef du PAA).

Visite au Centre de Recherche de l'USDA à Peoria (NCAUR)

Le National Center for Agricultural Utilization Research, où j'ai séjourné est le centre le plus important du dispositif. Nous collaborons avec le NCAUR depuis 1995 et des essais financés par l'ADEME y ont été réalisés dans le domaine de la chimie précombustionnelle de biocarburants diésel (thèse de N. Chirat). Le séjour a permis de discuter et de traduire un manuscrit en vue de sa publication.

Compte-tenu de mon affectation récente au PAA, les contacts vers deux groupes, huiles et polymères végétaux. La mise en commun des savoir-faire dans ce dernier domaine mais sur des produits d'origines différentes pourrait créer des synergies. Peter Johsen, Directeur du NCAUR, a réagi favorablement à la proposition de visiter les installations du CIRAD.

En conclusion, les objectifs fixés pour cette mission ont été atteints :

- *actions de communication visant à faire connaître les travaux du CIRAD.*
- *contacts industriels en lipochimie et en technologie membranaire.*
- *bilan de la collaboration avec le centre de l'USDA à Peoria*
- *favoriser l'ouverture de la communauté scientifique française dans le domaine de la "chimie verte" vers les industriels et scientifiques américains.*

MOTS CLES

Lipochimie - Huile de palme - Biocarburants - Etats Unis - Huile de palmiste

I - OBJET DE LA MISSION

La présente mission poursuivait principalement trois objectifs :

- Participation au 89ème congrès de l'American Oil Chemists' Society à Chicago

  - ➢ Contribution notable en tant que membre de l'AOCS sur le plan de l'organisation et sur le plan scientifique (deux communications)
  - ➢ Prise de contacts avec des industriels et des organismes de recherche

- Collaboration avec le National Center for Agriculture Utilization Research (Peoria IL)

  - ➢ Bilan de deux ans de collaboration en chimie précombustionnelle des biocarburants
  - ➢ Projet de poursuite des travaux
  - ➢ Elargissement des contacts avec les chercheurs en particulier dans le domaine des polymères naturels

- Favoriser les contacts entre mes collègues français et les chercheurs et industriels américains (valorisation des productions des filières oléagineuses). Contacts avec le Consulat de France.

CHRONOLOGIE DES ACTIVITES

Date	Activité	Contacts
Sam 09/05	Arrivée à Chicago	
Dim 10/05	Réunion d'organisation des sessions de la Division IOP Lunch de bienvenue	Bob DUN, Président de l'IOP Délégation française
Lun 11/05	Sessions de communications Première communication (biocarburants) Premier déjeuner annuel de la Division IOP	
Mar 12/05	Sessions de communications Dîner avec les scientifiques français	 Bernard CHARPENTIER Attaché de coopération
Mer 13/05	Présidence de session Visite des posters Trajet Chicago-Peoria en véhicule de l'USDA	avec Hans FRYKMAN collègues de l'USDA
Jeu 14/05	Bilan de la collaboration Déjeuner avec l'animateur du Groupe/huiles Rédaction article	Gary KNOTHE Sevin ERHAN Chercheurs du Groupe/huiles
Ven 15/05	Réunion avec le Directeur du Centre de Recherche Discussions avec des chercheurs Groupe/polymères Dîner avec Groupe/qualité	Peter JOHNSEN JL WILLETT Chercheurs du Groupe Visiteurs Hans Derksen (ATO-DLO)
Sam 16/05	Discussions Projet d'action poursuite de la collaboration	Gary KNOTHE Visiteur Sefa KOSEOGLU (Texas AP University)
Dim 17/05	Retour via Chicago	
Lun 18/05	Arrivée à Montpellier	

II - PARTICIPATION AU 89ème CONGRES DE L'AOCS A CHICAGO

II-1 ACTIVITÉ EN TANT QUE MEMBRE DE L'AOCS

L'American Oil Chemists' Society (AOCS) est la plus importante association dans le domaine des lipides à l'échelle mondiale, par le nombre de ses adhérents, le volume et la diversité de ses activités, aussi bien du point de vue des disciplines scientifiques couvertes que de l'étendue géographique de son influence.

Il n'existe pas d'équivalent à l'échelle européenne. Jusqu'à ce jour, les tentatives d'Eurolipids (Association européenne de Lipides) se sont heurtées à des difficultés en apparence insurmontables, probablement à cause de conflits d'intérêts individuels, entre groupes professionnels ou à l'échelle des pays.

Etre membre de l'AOCS répond donc pour moi à un besoin et offre de multiples avantages. Lors du congrès annuel à Seattle en 1997, j'avais noté un besoin d'amélioration de l'organisation des communications afin de s'adapter à l'évolution des axes de recherches. En effet, la forte motivation des groupements de producteurs agricoles et des industriels pour élargir les débouchés conduit à un nombre sans cesse croissant de propositions de communications dans le domaine des utilisations industrielles et/ou non alimentaires autres que les débouchés classiques dans le secteur des surfactifs (détergents) au sans strict. Jusqu'en 1997 ces communications étaient gérées par la Division Biotechnologie de l'AOCS alors que les thèmes traités étaient bien différents. Cette situation ne permettait pas d'assurer une représentativité suffisante de ces activités.

Cet avis étant partagé par plusieurs collègues du Centre de recherche de l'USDA à Peoria avec lequel je collabore par ailleurs, nous avons effectué les démarches appropriées auprès de l'AOCS et une nouvelle Division a été créée sous le titre "Industrial Oil Products" (IOP) regroupe les thèmes de recherche suivants :

- Dérivés nouveaux des acides gras et procédés d'obtention (hors catalyse enzymatique)
- Nouvelles utilisations industrielles des corps gras et de leurs dérivés
- Biocarburants et biocombustibles dérivés des filières oléagineuses

Cette nouvelle division (statuts en Annexe I-1) regroupe bon nombre de mes thèmes de recherche actuels et constitue donc un lieu d'échanges particulièrement fructueux.

Ma contribution a consisté à informer et réunir les signatures des membres européens intéressés (soit environ 25%) afin d'appuyer notre demande auprès du Conseil d'Administration de l'AOCS.

II-2 ORGANISATION D'UNE SESSION ET PRÉSIDENCE LORS DU CONGRÈS

La création de la division IOP a permis l'organisation de cinq sessions sur les thèmes ci-dessus. Le nombre de communications élevé dès la première année (près de 60) montre bien l'intérêt de notre démarche. L'organisation de l'une des sessions m'a été confiée et, afin de faciliter les contacts avec le Président de la Division Bob Dun qui est basé au Centre de recherche de l'USDA à Peoria, un jeune chercheur de ce centre Hans Frykman m'a été proposé comme co-organisateur.

Cette session dont le thème était "General Industrial Oil Products" a rassemblé 11 conférenciers (programme en Annexe I-2) dont 5 français. Pour ce dernier point, il s'agit là d'un effet direct de mon implication dans l'organisation, dans le but de favoriser les échanges entre les deux communautés scientifiques. Ceux-ci étaient à mon avis insuffisants les années précédentes, le nombre de chercheurs et industriels français étant réduit à une dizaine, toutes disciplines confondues. Cette année la communauté française a inscrit 23 participants.

II-3 COMMUNICATIONS SCIENTIFIQUES DU CIRAD

Au cours des sessions organisées par la Division IOP, j'ai présenté deux communications -les seules du CIRAD- relatives aux activités de l'Equipe PCBM/PAA dont l'animation m'a été confiée depuis le début de l'année (résultats acquis au CIRAD-CP). Les résumés sont donnés en Annexe I-2.

Fatty Ketones, A New Route to Oleochemicals"

D. Pioch, J. Graille, R. Lescure, Tang Thin Sue

Cette communication faite au cours de la session que je présidais résumait une partie des travaux réalisés pendant la thèse de Régis Lescure et poursuivis en collaboration avec le Palm Oil Research Institute of Malaysia (PORIM) dont j'assure la coordination pour le compte du CIRAD-CP/Programme Palmier à huile.

Cette action a pour objectif d'aider le PORIM à proposer des produits nouveaux afin d'élargir les débouchés des huiles de palme et palmiste. Ces dérivés couvrent une large palette de structures chimiques et donc d'applications : détergents, lubrifiants, agents anti-mousse ou biocides.

Au delà des aspects purement scientifiques, cette action affiche la collaboration avec le PORIM et les questions en fin d'exposé ont permis d'identifier deux industriels intéressés par certains de ces travaux.

"Precombustion Chemistry of Vegetable Oil-Based Biofuels"

D. Pioch, N. Chirat, P. Lozano, T.W. Ryan, G. Knothe.

La deuxième communication exposait une partie de la thèse de Nathalie Chirat. Elle portait plus spécialement sur les résultats obtenus dans le cadre de la collaboration avec le centre de recherche de Peoria (US Department of Agriculture).

Le but de ces travaux financés par l'ADEME est de mieux comprendre les propriétés particulières des huiles végétales en tant que carburants diésel, propriétés surprenantes compte-tenu de la différence de structure chimique avec les hydrocarbures pétroliers. La masse moléculaire élevée des triglycérides, leur structure de type ramifié défavorable à l'indice de cétane et l'absence de fraction "légère" susceptible de passer rapidement en phase vapeur au cours de l'injection, plaident en faveur d'un comportement différent. Nous avons donc émis l'hypothèse de la pyrolyse préalable.

Sa modélisation permettra de parfaire l'optimisation des moteurs acceptant les huiles-carburants faite par exemple par mes collègues Gilles Vaitilingom et Alain Liennard de l'Equipe PCBM et fournira aussi des indications sur les structures chimiques d'additifs dérivés des productions agricoles aptes à améliorer les propriétés de combustion (additifs procétane).

Cette communication qui complète celle faite au cours du précédent congrès de l'AOCS à Seattle en 1997 permet à l'Equipe PCBM d'asseoir son expérience dans ce domaine où peu de travaux sont entrepris en raison de la difficulté du point de vue expérimental. Pour cette raison les travaux ont été effectués en collaboration avec nos collègues américains de l'USDA qui ont accès à des équipements spécialisés et ressentent eux aussi le besoin de mettre en commun leurs compétences afin de constituer un groupe de taille suffisante et pluridisciplinaire.

Le responsable de l'ADEME pour les utilisations non alimentaires et bailleur de fonds du présent projet, Jean-Paul Gaouyer, que nous avions incité à participer, a pu constater l'accueil fait par nos pairs et situer l'intérêt de ces travaux co-signés par l'USDA et le CIRAD (cf copie du courrier du Président de la Division IOP à l'Annexe I-2).

II-4 SYNTHESE DES COMMUNICATIONS SCIENTIFIQUES

Le congrès totalise environ 400 présentations orales et 125 par affiche, réparties entre les divisons suivantes :

Analyse, Biotechnologie, Technologie des applications alimentaires, Microscopie, Nutrition et santé, Produits Industriels (Non alimentaires), Oxydation et qualité, Phospholipides, Traitements industriels, Huiles spéciales (ratites), Surfactants et détergents.

La liste complète des thèmes développés (titres de sessions) est donnée à l'Annexe I-3.

A cause de la tenue de cinq à dix sessions simultanées sur chaque demi-journée, il est évidemment impossible d'assister à toutes les communications sélectionnées à partir du programme.

Parmi les thèmes développés par la Division Industrial Oil Products qui m'interessait particulièrement, il faut signaler le regain d'intérêt pour la fonctionnalisation des chaînes hydrocarbonées, noté par ailleurs dans les dossiers proposés pour financement par AGRICE en France.

La catalyse hétérogène (catalyseurs minéraux solides) y trouve naturellement sa place. A coté des composés oxygénés "classiques" tels les époxydes ou les composés hydroxylés, plusieurs voies catalytiques ou structures de composés vraiment originales sont proposées.

Ce thème est aussi développé au CIRAD-AMIS/PAA/ PCBM où deux sujets de recherche sont en cours dans des domaines peu explorés, ce qui laisse espérer des résultats sur le plan scientifique mais aussi des propriétés intéressantes pour les applications industrielles. Le domaine des lubrifiants qui concerne plusieurs conférences est aussi l'une des cibles de nos recherches notamment du fait de l'existance d'une compétence en matière de moteurs au CIRAD ; par contre nous n'avons pas investi dans celui des polymères (matériaux) ni des peintures, pourtant liés à des tonnages considérables, faute de moyens humains.

Il convient de poursuivre la réflexion inter-programmes au CIRAD afin de trouver quelles synergies pourraient être activées dans le domaine des matériaux notamment. Pour s'en tenir au domaine de la friture, thème transversal au CIRAD, il conviendrait de se préoccuper de la valorisation des huiles usagées ; deux communications se situaient dans ce domaine. La valorisation des co-produits est d'autant plus intéressante dans les PVD où intervient le CIRAD que les matières premières font souvent défaut ou en tout cas leur prix est souvent prohibitif.

A l'extérieur de la division IOP, plusieurs communications concernaient la production et les propriétés nutritionnelles de produits riches en acides gras polyinsaturés dérivés des huiles marines. Ce thème est actuellement abordé par l'équipe PCBM dans deux collaborations dont l'une avec l'Asian Institute of Technology (Bangkok; valorisation des produits de la mer). La combinaison d'une étape enzymatique et de la technologie membranaire apparemment inédite dans ce domaine et que nous projetons, parait porteuse.

Deux organismes sont particulièrement actifs dans ces domaines, ATO-DLO (Pays-Bas) et l'USDA-Agricultural Research Service, avec lequel nous collaborons.

II-5 CONTACTS PRIS AU COURS DU CONGRES

En dehors de la "délégation française" dont il a déjà été question, et de mes collègues de l'USDA à Peoria (cf partie II), le congrès a permis de prendre de nombreux contacts dans mes principaux domaines d'intérêt. Les coordonnées des personnes citées ci-après sont données à l'Annexe I-4.

En lipochimie, la communication sur les cétones a permis de rencontrer Daniel Lemke et Phillip Abend, Chefs de laboratoire chez deux grands groupes lipochimistes, respectivement LONZA et CRODA INC, qui ont demandé des tirés à part ainsi que Jim Realy et Ravi Subramanyam travaillant respectivement chez WITCO (ARGUS) et COLGATE-PALMOLIVE et qui seraient intéressés par nos produits.

Pour ce qui est des procédés, les contacts les plus intéressants sont les suivants :

- Katalin Kovari, Directeur du Centre de Recherche du Groupe CEREOL à Budapest est interessée par le raffinage de l'huile de tournesol sur membrane et se souvient de ma communication sur ce thème en 1997 dans un autre congrès international. Nous sommes en contact avec ses collègues français en particulier avec l'usine de trituration et de raffinage de Sète. L'appui de Mme Kovari pourrait être efficace pour conclure une collaboration soit avec la filiale hongroise soit avec la société mère en France.

- Kennneth Carlson est directeur d'une petite société qui propose des équipements adaptés au traitement des produits de spécialités (faibles volumes) et souhaiterait faire profiter ses clients des avantages de la technologie membranaire. Cependant la taille de sa société ne lui permet pas d'entreprendre une action dans ce domaine pour le moment. Le contact devra être maintenu dans

la mesure où le domaine des huiles de spécialités est l'un des marchés ciblés en priorité pour une application industrielle des résultats de la thèse de Christophe Larguèze (collaboration avec l'Université de Marrakech et l'ENSAIA, Nancy).

- Anthony Athanassiadis, consultant belge, possède une expérience reconnue en matière de raffinage des huiles et ses conseils seraient précieux pour définir le meilleur itinéraire technique pour des essais pilotes préindustriels de raffinage par filtration, projetés avec la Société des Céramiques Techniques (Tarbes).

- Le contact a été pris avec les nouveaux responsables techniques du groupe belge VANDEMOORTELE, Pieter Maes et Danny Van Steenkiste, auprès duquel notre proposition de collaboration n'a pas abouti en 1996.

Par ailleurs, au cours du congrès mon collègue Tom Foglia (USDA Centre de recherche de Philadelphie) et moi-même avons évoqué l'éventualité d'une collaboration sur la valorisation des huiles de friture usagées; Tom pourrait se charger de la modification par voie enzymatique et le CIRAD de tester les propriétés des produits. Le programme de recherche reste à mettre au point ainsi que le financement.

Le congrès a donné l'occasion de discuter avec Hans Derksen et F. Cuperus, respectivement responsables des divisions Matériaux Renouvelables/Applications non Alimentaires et Technologies des Huiles et Membranaires (Agrotechnological Research Institute, ATO-DLO, Pays-bas). Les compétences de ces collègues avec lesquels nous sommes parfois en compétition sont aussi complémentaires de celles du PAA. Ils m'ont invité à visiter leurs laboratoires et sont prêts à rechercher des domaines dans lesquels nous pourrions nous associer.

Une proposition a été faite dans ce sens à Anne-Lucie Wack, Chef du Programme Agro-Alimentaire du CIRAD-AMIS (courrier de ATO-DLO en Annexe I-4). Ce centre de recherche a un taux de croissance de ses effectifs de 10% par an.

Enfin j'ai pu donner suite à un premier contact avec la société CIIF pris lors d'un précédent congrès organisé également par l'AOCS (Bali, février 1998). Ayant reçu peu avant le présent congrès un courrier de Mme Evangeline Moro, Directeur Adjoint, j'ai eu l'opportunité de poursuivre la discussion avec elle, à propos d'une d'une collaboration visant à revaloriser

certaines coupes de distillation d'acides gras de coprah (action avec le CIRAD CP, Programme Cocotier).

Une mission conjointe avec un consultant français déjà identifié est envisagée, préalablement à l'établissement d'une proposition d'action de R&D en lipochimie.

III - VISITE AU CENTRE DE RECHERCHE DE L'US DEPARTMENT OF AGRICULTURE A PEORIA

III-1 BILAN DES ACTIVITES DE COOPERATION SUR LES BIOCARBURANTS

Le CIRAD-CP, maintenant donc le CIRAD-AMIS, collabore avec le centre de recherche de Peoria de l'US Department of Agriculture depuis 1995. Des essais financés par l'ADEME ont été réalisés aux Etat-Unis dans le domaine de la chimie précombustionnelle dans le cadre de la thèse de Nathalie Chirat. Elle portait sur la mise au point de méthodes d'évaluation de la qualité de carburants diesel dérivés des huiles végétales, (cf paragraphe I-3). Nathalie Chirat a ainsi séjourné pendant 5 mois à Peoria ainsi qu'à San Antonio.

Le présent séjour à Peoria (ainsi que le trajet Chicago-Peoria) a permis de dresser le bilan des activités depuis prés de trois ans. En premier lieu les bons rapports entretenus entre les deux équipes ont permis de surmonter avec efficacité les nombreuses difficultés auxquelles nous avons dû faire face. Rien ne s'oppose donc au lancement d'une deuxième phase de ce point de vue.

Sur le plan scientifique, à la difficulté d'interprétation des résultats liée pour une large part au caractère pionnier des travaux, s'ajoutent de nombreuses imprécisions provenant du fait que ces essais préliminaires n'ont pas permis d'optimiser et d'étalonner l'appareillage dans le temps imparti. De plus des contraintes pratiques liées à la disponibilité d'appareillages et aux conditions limites de service de certains composants n'ont pas autorisé l'exploration de la plage de température et de pression choisie initialement par analogie aux conditions réelles dans un moteur.

Néanmoins nos résultats constituent sans conteste un premier pas dans un domaine où, à notre connaissance, peu d'équipes osent s'aventurer. Pour l'instant nous avons prouvé le comportement singulier des triglycérides par rapport aux hydrocarbures pétroliers au cours de l'injection et montré l'extrême sensibilité de la chimie précombustionnelle aux conditions de température et de pression qui règnent dans la chambre. La présence de plusieurs séries de composés néoformés (aldhéydes en particulier) parait être liée aux performances du carburant.

III-2 REDACTION D'UN ARTICLE SCIENTIFIQUE

Au cours du séjour de deux jour et demi, une partie du temps a été consacrée à discuter et traduire avec mon collègue Gary Knothe un manuscrit premier jet rédigé en français. Il reste maintenant à le mettre au format avant envoi au journal en vue de sa publication.

III-3 PROJETS DE RECHERCHE

Un programme de recherche a été établi pour une deuxième phase de collaboration. Il comporte d'abord une évaluation complète de l'influence des différents paramètres expérimentaux, le choix des protocoles opératoires les mieux adaptés, puis la validation de ces derniers avant de commencer l'étude de la chimie précombustionnelle des huiles végétales proprement dites.

Nous espérons aboutir à la modélisation du comportement des huiles-carburants en fonction de l'insaturation (type d'huile) et par comparaison au gazole pétrolier dont elles se démarquent résolument et dans le bon sens, contrairement à ce que laisserait penser une prévision basée sur les différences de structure moléculaire.
Cette modélisation sera susceptible de conduire ensuite à meilleure adaptation des moteurs par nos collègues ainsi qu'à la sélection des additifs les mieux adaptés aux biocarburants et éventuellement aux carburants pétroliers. Un programme de synthèse d'additifs à partir d'huiles végétales est d'ailleurs sur le point de débuter dans notre laboratoire et l'effet de ces derniers pourrait être caractérisé de façon plus fine dans le cadre du présent projet.

III-4 PRÉSENTATION DU NCAUR

Au cours de cette visite, j'ai été reçu par Peter Johnsen, Directeur du Centre, comme cela a aussi été le cas pour les précédentes. J'ai aussi retrouvé mes collègues de ATO-DLO (Pays-Bas) dont il a été question à propos du congrès de Chicago.

Ce centre de recherche de l'U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS), est situé à Peoria au centre de l'Illinois, ce qui le destine naturellement à travailler en priorité sur les grandes cultures locales, soja et maïs. Il constitue l'un des quatre plus importants centres de l'USDA-ARS, avec ceux implantés à Berkeley, Philadelphie et la Nouvelle Orléans. La mission essentielle du NCAUR (National Center for Agricultural Utilization Research) est de rechercher et de finaliser des utilisations non alimentaires des produits agricoles.

L'ARS (Agricultural Research Service) est l'organisme de recherche du ministère fédéral de l'agriculture (USDA). L'ARS dont le siège est à Beltsville (Maryland), dispose d'environ 120 centres de recherche et sites expérimentaux le plus souvent au sein des universités.

Peoria est le centre de coordination du Midwest, qui regroupe 8 Etats (Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, et Ohio) et compte 2 centres de recherche : Peoria, IL et Ames, IA. (1200 personnes dont 320 chercheurs).

Le National Center for Agricultural Utilization Research (NCAUR) qui est le nom officiel du Centre de Peoria où j'ai séjourné, est le plus important du dispositif de l'ARS, avec un budget de 23 millions de $ et plus de 300 personnes dont 110 chercheurs.

Historiquement, ce centre a développé la technologie de fermentation pour la production de pénicilline et de nombreux antibiotiques. Il est à l'origine de la production de dextrane, de xanthane, de nombreuses innovations améliorant la qualité des huiles de soja et les usages des amidons.

Depuis 1980, le NCAUR a déposé 600 brevets et cédé plus de 270 licences. Le centre dispose d'une équipe de valorisation des innovations, comprenant notamment un économiste et un juriste. De nombreux projets sont conduits en partenariat avec l'industrie par le biais de Cooperative Research and Development Agreements (CRADA), définissant les conditions de confidentialité, de propriété des résultats et de financement

- Le centre compte 10 unités de recherche, d'une dizaine de chercheurs chacune. La liste des unités de recherche ci-après avec lesquelles j'ai eu des contacts est complétée en annexe par la copie de l'une des plaquettes de présentation ainsi que divers résumés d'activités :

- Qualité et sécurité alimentaire
- Nouvelles plantes pour l'agriculture
- Polymères végétaux (naturels)
- Biopolymères (synthèse enzymatique)
- Propriétés chimiques des huiles végétales
- Mycotoxines

III-5 ENTRETIENS AVEC DES CHERCHEURS DU NCAUR

Compte-tenu de mon affectation au Programme Agro-Alimentaire récemment créé au CIRAD-AMIS, l'activité de deux groupes a particulièrement retenu mon attention cette année, travaillant l'un sur les huiles végétales dont je connais évidemment l'ensemble des chercheurs et l'autre sur les polymères végétaux.

Le premier qui est animé par Sevim Erhan, comprend une dizaine d'agents dont quatre chercheurs et développe les thèmes suivants : esters-carburants (chimie précombustionnelle), additifs dérivés des huiles végétales pour carburants et lubrifiants (résistance haute température), formulation et propriétés d'encres à base d'huile de soja. Ces thèmes recouvrent pour partie ceux développés au PAA/CIRAD-AMIS par l'équipe PCBM.

Le second groupe qui est animé par J.L Willett (22 personnes), possède une expérience étendue dans le domaine du traitement et de l'étude des propriétés d'amidons et de protéines : copolymères, formulations avec d'autres polymères, composites, réaction-extrusion, biodégradation, propriétés structurales, perméabilité à la vapeur d'eau, sorption, rhéologie. Les copies d'un article de synthèse sur les résultats dans le domaine des amidons et de la plaquette de présentation de ces activités sont jointes en annexe. J'ai demandé les tirés à part des publications de ce groupe depuis les 5 dernières années, qui sont maintenant à la disposition de mes collègues du CIRAD impliqués dans ces domaines.

De plus cette visite m'a donné l'opportunité d'entretenir les contacts avec un certain nombre de collègues au hasard de mes déplacements dans le centre. Les coordonnées des personnes rencontrées sont données à l'Annexe II-3.

IV - ENTRETIEN AVEC L'ATTACHE DE COOPERATION SCIENTIFIQUE - CONSULAT GENERAL DE FRANCE

J'entretiens des rapports très cordiaux avec Bernard Charpentier, Attaché Scientifique basé au Consulat Général de France à Chicago depuis sa nomination au poste en 1997 en remplacement d'Olivier Massenet. Une visite improvisée du NCAUR et d'un laboratoire universitaire à Champaign (Il.) avait été organisée en mai 1997 afin d'informer Bernard Charpentier sur nos activités et faciliter un élargissement de la collaboration à d'autres organismes français. Cette visite avait donné lieu l'émission d'un rapport (cf Annexe II-4).

En 1998, Bernard Charpentier a aidé la présente mission sur le plan financier afin de permettre sa réalisation compte-tenu des contraintes financières (fin de contrat avec l'ADEME). Le programme avait été discuté au préalable, à savoir la participation au congrès de l'AOCS et la visite au NCAUR. Les objectifs de la mission, poursuite de la collaboration et déplacement d'une délégation française plus étoffée, vont dans le sens d'une présence accrue de la communauté scientifique française aux Etats Unis.

Il faut souligner par exemple que la participation française à Chicago a été doublée par rapport au congrès de 1997 à Seattle avec 23 inscrits (INRA 6 ; Universités et Ecoles 4 ; Industriels et consultants 4 ; CETIOM 2 ; CIRAD 2 ; ITERG 2 ; IFP 1 ; ONIDOL 1 ; ADEME-AGRICE 1). Ce chiffre est plus en rapport avec l'activité des industriels et organismes de recherche de l'hexagone dans les différents domaines concernés, par comparaison à nos voisins européens : Allemagne 51 ; Royaume-Uni 44 ; Danemark 30 ; Pays -Bas 24 ; Italie 7 ; Espagne 2.

J'ai naturellement servi d'intermédiaire pour informer mes collègues français du souhait de Bernard Charpentier de les rencontrer au cours d'un dîner fort sympathique qui a réuni la majorité d'entre eux le mardi 12 mai (Annexe II-4).

Parmi les participants français au congrès dont la liste a été remise à Bernard Charpentier, il faut mentionner Jean-Paul Gaouyer, Responsable des applications non alimentaires de l'ADEME et Sylvain Claude, Responsable des recherches chez SOFIPROTEOL. Tous deux ont ainsi pu prendre connaissance des grands thèmes de recherche développés notamment par l'USDA-ARS dans le domaine non alimentaire et comparer aux sujets de recherche financés en France par les organismes compétents, situant ainsi notre effort par rapport aux concurrents nord-américains.

V - BILAN DE LA MISSION

Les objectifs fixés pour cette mission ont été atteints :

- Actions de communication visant à faire connaître les travaux du CIRAD.

La préparation de deux communications représente une somme de travail considérable pour un seul chercheur.

- Contacts industriels en lipochimie

En sus des contacts pris avec des multinationales, la discussion à propos d'une collaboration industrielle aux Philippines a pu être poursuivie.

- Contacts industriels en technologie membranaire.

Certains contacts ont été poursuivis à la date de rédaction du rapport.

Ce thème gagnerait à être traité de façon "transversale" au CIRAD et, compte-tenu de mon activité dans ce domaine, je souhaite proposer une action de structuration (Action Thématique Programmée, équipements communs, groupe de travail, diversification des problèmes traités).

- Favoriser l'ouverture de la communauté scientifique française dans mon domaine vers les industriels et scientifiques américains.

La participation record au congrès est déjà un résultat tangible. Le contact pris avec le poste de coopération scientifique de l'Ambassade de France, l'Attaché basé à Chicago en l'occurrence, pourra faciliter des développements ultérieurs.

- Collaboration avec le centre de l'USDA à Peoria (NCAUR).

La publication des résultats est en bonne voie et les grandes lignes d'une deuxième phase de collaboration ont été définies. Pour ce qui est de la partie française, nous devons maintenant nous attacher à présenter un dossier à l'ADEME en tenant compte des priorités de cette dernière.

Malgrè la brièveté du séjour plusieurs scientifiques ont pu être rencontrés, en particulier dans le domaine des polymères naturels où le NCAUR et, dans une moindre mesure, le CIRAD possèdent une longue expérience. La mise en commun de ces savoir-faire sur des filières-plantes différentes pourrait être porteuse de synergies.

Peter Johnsen, Directeur du NCAUR, a réagi favorablement à ma proposition de visiter les installations du CIRAD. Une invitation de notre Ambassade faciliterait évidemment cette visite qui pourrait être combinée par exemple à celle des installations de l'USDA sur le campus de Baillarguet près de Montpelllier.

ANNEXE 1

CONGRES DE L'AOCS

I-1 - Création de la division IOP

I-2 - Session organisée dans le cadre de l'IOP et communications du CIRAD

I-3 - Organigramme et thèmes des sessions

I-4 - Coordonnées des personnes rencontrées et courriers échangés

AOCS

AN INTERNATIONAL SOCIETY FOR THE SCIENCE AND TECHNOLOGY OF FATS, OILS, AND RELATED MATERIALS

Mail Address: AOCS, P.O. Box 3489, Champaign, IL 61826-3489 USA • **Street Address:** AOCS, 1608 Broadmoor Dr., Champaign, IL 61821-5930 USA
Phone: 1-217-359-2344 • **Fax:** 1-217-351-8091 • **E-Mail:** general@aocs.org

May 28, 1998

Dear IOP Division Charter Member:

I congratulate you on joining the Industrial Oil Products (IOP) Division of the AOCS during its first year. As a charter member, you are very important to the direction that our Division will take in our formative years. We can only succeed with your participation in the process of formulating technical programs and symposia and in promoting the exchange of information in the field of industrial products from fats and oils.

The Division will function best when there is extensive involvement by all its members. That means volunteering as candidates for Division Board positions, participating in Division elections, and attending Division functions at the AOCS Annual Meeting & Expo and throughout the year. I look forward to working with all of you in the future.

To express the appreciation of the IOP Division and to commemorate your charter membership, please accept this certificate on behalf of myself and the Division.

Respectfully yours,

Robert O. Dunn

Robert O. Dunn
IOP Division Chairperson

This is to certify that

Daniel Pioch

is a founding member of the
Industrial Oil Products Division
of the AOCS

President
Monday, May 11, 1998

Proposed By-Laws

THE INDUSTRIAL OIL PRODUCTS DIVISION
of
THE AMERICAN OIL CHEMISTS' SOCIETY

March 26, 1998

ARTICLE I
Name

The name of this organization is the Industrial Oil Products Division of the American Oil Chemists' Society hereinafter referred to as "Division" and "Society", respectively.

ARTICLE II
Purpose

The objective of the Division is to provide a forum for the exchange and dissemination of information and to further contacts among professionals involved in research, development, engineering, marketing and testing of industrial products from fats and oils.

ARTICLE III
Definition and Scope

The Division shall operate within the Articles of Incorporation and By-Laws of the Society. In addition, the Division shall have a supplementary set of by-laws to govern its conduct. The scope of the Division includes topics such as fuels, lubricants, coatings, polymers, paints, inks, cosmetics and dielectric fluids from fats and oils. Synthesis of novel derivatives from fats and oils with potential as new industrial products and genetically engineered new crops are also included.

ARTICLE IV
Membership and Dues

1. THE DIVISION AND ITS MEMBERS. All members of the Society are eligible for membership in the Division. Dues-paying members of the Society shall pay additional dues, if they desire to belong to the Division.

Division members exempt from paying dues to the Society are also exempt from paying dues to the Division but shall have all rights and privileges of Division membership.

Active student members, individual associate members and corporate associate members shall not be entitled to vote or hold elective office but shall enjoy all other rights and privileges.

2. DUES. Dues to cover normal operating expenses of the Division shall be set by the Division Board. Dues will normally be collected through the Society's annual billing. They may also be received directly from individuals throughout the calendar year.

3. CODE OF ETHICS. Division members shall subscribe to the Code of Ethics as expressed in the Articles of Incorporation of the Society.

4. JOINING, ELECTION, RESIGNATION. Membership in the Division becomes effective when the Division Treasurer has:

1. received Division dues directly from the member, or

2. received Division dues on behalf of the member from the Society Executive Director, or

3. been notified by the Society Executive Director that a dues-exempt member has requested membership in the Division

Membership in the Division without membership in the Society is allowable, however, division members who are not AOCS members should be encouraged to join the Society.

A member in good standing may resign from the Division upon written notice to the Secretary. Any dues-paying member shall be considered to have resigned if Division dues have not been received by April 1 of the current year. A dues-exempt member shall be considered to have resigned if he/she fails to indicate a desire to continue membership on the annual billing notice of the Society.

Provisions of the Society for suspending dues without penalty shall apply to the Division also.

5. EXPULSION. Expulsion from the Society automatically causes expulsion from the Division.

ARTICLE V
Officers and Division Board

1. OFFICERS AND THEIR ELECTION. The officers of the Division shall be the Division Chair, Chair-elect, Past Chair and Secretary/Treasurer. Chair-elect shall be elected by secret ballot every year and shall serve for a term of one year or until successors are duly elected and qualified. Secretary/Treasurer and Members-at-Large shall be elected every two years by secret ballot and shall serve for a term of two years or until successors are duly elected and qualified. Past-Chair and Chair are offices filled by the previous Chair and Chair-elect unless they are are unwilling or unable, in which case a successor will be appointed as described for vacancies below. No elected officer may serve in the same office for more than two consecutive terms. The office of Secretary/Treasurer may be divided into two offices with the approval of the Division Board.

Elections shall be conducted by letter ballot by the Nominating and Election Committee. In case of a tie vote for any office, one of the candidates shall be elected by a majority vote of the Division Board in office.

Vacancies among elected Board Members shall be filled by the Division Chair with the unanimous consent of the remaining Board Members.

2. BOARD MEMBERS AT-LARGE AND THEIR ELECTION. Two Board Members-At-Large shall be elected for a two-year term in the same election and on the same secret ballot in which Division officers are elected. In case of a tie vote for a Board Member-At-Large, one of the candidates shall be elected by majority vote of the Division Board.

No elected Board Member-At-Large may serve more than two consecutive terms of office. Vacancies among Board Members-At-Large shall be filled by the Division Chair with the unanimous consent of the remaining Board Members.

3. GROUP CHAIRS. Group Chairs may be nominated by the Chair-elect annually and approved by the Division Board. Group Chairs can serve no more than three years.

4. DIVISION BOARD. The Division Board shall consist of the Past-Chair, Chair, Chair-elect, Secretary, Treasurer and two Board Members-At-Large.

The Division Board shall conduct the affairs of the Division for two years or until a new Board is elected.

ARTICLE VI
Election of Officers and Division Board Members-At-Large

1. NOMINATION AND ELECTION COMMITTEE. In the first year of formation of the

DIvision, the steering committee shall serve as the nominations and election committee. The Chair-elect of the Division shall serve as Chair of the Nomination and Election Committee. In addition to the Chair-elect, the Nomination and Elecction Committee shall consist of the two members-at-large serving on the Division Board. The Nomination and Election Committee shall present a slate of candidates and appointments to the Division Board for approval. Candidates should represent the diverse interests of Division members. The Nomination and Election Committee reserves the right to run Candidates opposed or unopposed.

2. ELECTION PROCESS. A call for nominations shall appear in the Division Newsletter prior to the development of a slate of candidates. Once the slate of candidates is approved by the Division Board the ballot shall be presented to the Division membership for approval. Ballots shall be sent to all Division members and returned to AOCS headquarters for counting. Results of the election shall be communicated to the Division Chair. Results of the elections should be announced at the business meeting of the Division held during the AOCS Annual Meeting and Expo.

3. ELECTION BALLOT. The Chair-elect, if eligible, shall be nominated without opposition for the office of Chair. If for any reason, the Chair-elect is not a candidate for Chair, the Nomination and Election Committee shall nominate two candidates for the office of Chair.

ARTICLE VII
Duties of the Officers

1. The officers shall perform the duties customarily associated with the offices they hold unless provided otherwise in the Articles of Incorporation and By-laws of the Society. Specific responsibilities will be outlined by the Division Board.

ARTICLE VIII
Division Board Duties

The Division Board is the general executive body of the Division. The Division Board shall determine the policies and direct the affairs of the Division to promote its best interests. It shall direct the manner in which all funds are to be expended and invested and shall set the annual dues of members.

Five voting members of the Division Board shall constitute a quorum.

ARTICLE IX
Appointed Committees

1. TYPES OF COMMITTEES. The Division Board may appoint committees and representatives to AOCS committees as needed.

ARTICLE X
Meetings

1. TIME AND PLACE OF MEETINGS. There shall be at least one business meeting of the Division each year in connection with the annual meeting of the Society but no conflicting with the annual business meeting of the Society. It is the goal of the Division to have an additional planning meeting each year.

2. NOTICE OF MEETINGS. At least thirty days notice of time, place, and purpose of each regular or special meeting shall be communicated to members of the Division.

3. POSTPONEMENT OF MEETINGS. If the annual meeting cannot be held for a valid reason, the Division Board shall announce the results of election to the membership by newsletter or mail.

If no quorum exists at an annual meeting of the Division, the Division Board may submit any matter originally scheduled for presentation at the meeting to the membership for ratification or rejection by letter ballot.

ARTICLE XI
Meeting Procedures

1. QUORUM. Twenty-five members present shall constitute a quorum for conducting Division business. Any member may cast his/her vote in person or by written proxy. The majority of votes cast upon any question shall control.

2. VOTING. Every question coming before a meeting of the Division, the Division Board or a committee shall be decided by a majority of the votes cast unless otherwise provided by the Articles of Incorporation or the By-laws of the Society or Division.

3. PROCEDURE. Robert's Rules of Order, Revised, its most recent available edition, shall govern meetings of Division, wherever applicable.

ARTICLE XII
Amendments to the By-laws

Proposed amendments of the By-laws shall be presented in writing to the Division Board and if approved by a majority of the Board, shall be communicated to Division members at the annual meeting of the Division. At the annual meeting of the Division, the proposed amendments shall be presented by a member of the Division Board for adoption or rejection. A favorable vote by a quorum of members present certifies adoption. Alternatively, the proposed amendments may be submitted to the membership by mail ballots. Amendments approved by the Division membership at the annual meeting or by mail ballot shall take effect immediately.

ARTICLE XIII
Duration of the Division

The duration of the Division shall be perpetual but shall not exceed the duration of the Society.

ARTICLE XIV
Dissolution

No part of the net earnings of Division shall inure to the benefit of any private individual. In the event of dissolution of the Division, its assets shall be applied first to the payment of its obligations. Any assets remaining shall be transferred to the Governing Board of the Society.

United States Department of Agriculture
Agricultural Research Service Midwest Area
National Center for Agricultural Utilization Research
1815 North University Street
Peoria, Illinois 61604
Telephone: 309-685-4011
FAX: 309-681-6686

October 30, 1997

Dr. Daniel Pioch
CIRAD-CP
Laboratoire de Lipotechnie
BP 5035
34032 Montpellier Cedex 1
France

Dear Daniel,

Enclosed is a tentative technical program for the AOCS Industrial Oil Products Division "Alternative Diesel Fuels" symposium to be held at the 89th American Oil Chemists' Society Annual Meeting & Expo, May 10-13, 1998, at the Chicago Hilton and Towers.

Thanks again for agreeing to participate in the symposium. We are looking forward to hearing you present the paper "Precombustion Chemistry of Vegetable Oil-Based Fuels. Relationship with Ignition Delay and Ignition Temperature."

Please complete and return the enclosed abstract form to me ***no later than December 15, 1997.*** This deadline will allow me time to organize the final program for submission to the technical program chair. Please organize your talk to fit within 20 minutes time including a brief question period.

Sincerely,

Robert O. Dunn

Robert O. Dunn
Chemical Engineer
Oil Chemical Research

Phone: 309-681-6511
FAX: 309-681-6340
E-mail: dunnro@mail.ncaur.usda.gov

cc: OC File
G. Knothe

IOP 5: General Industrial Oil Products

(developed in conjunction with the AOCS Industrial Oil Products Division)

Room: Williford A/B

Chairpersons: H. Frykman, NCAUR, ARS, USDA, USA; and D. Pioch, CIRAD, France.

8:15 **Opening Remarks**

8:20 **Industrial Applications of Vegetable Oils: Lubrication Oils.** Dharma R. Kodali, Cargill Central Research, USA.

8:40 **C=O/C=S Exchange in the Carboxylic Part of Triglycerides. Thiono Derivatives as Antiwear and Extreme Pressure Additives in Lubricants.** Z. Mouloungui, V. Eychenne, and A. Gaset, INRA, France.

9:00 **Alkylation or Co-Oligomerization of Fatty Acids or Esters with Ethylene.** G. Hillion, D. Ballerini, A. Kotoko, and R. Stern, Institute Francais du Petrole, France.

9:20 **GC–MS Identification of By-Products from Soybean Oil During Heat Polymerization.** Quan Sheng and Sevim Z. Erhan, NCAUR, ARS, USDA, USA.

9:40 **Fatty Ketones: A New Route to Oleochemicals.** D. Pioch[a], R. Lescure[a], J. Graille[a], and Tang Thin Sue[b], [a]CIRAD-CP, France; and [b]PORIM, Malaysia.

10:00 **Oxidative Stability System in Meadowfoam.** T.P. Abbott and T.A. Isbell, NCAUR, ARS, USDA, USA.

10:20 **A Comparison of the Chemical Properties of Asclepias Seed Oil Stored Under Various Conditions.** B.S. Phillips[a], R.D. Fries[b], K.A. Rennick[a], and T.P. Abbott[a], [a]NCAUR, ARS, USDA, USA; [b]Natural Fibers Corporation, USA.

10:40 **AGRICE: Research Activities in France in the Area of Oil Chemistry.** Jean Paul Gaouyer, ADEME, France.

11:00 **New Outlets for Glycerol—Recent Developments in France.** Sylvain Claude, Onidol, France.

11:20 **Castor Oil: Derivatives and Uses.** Roger Logan, O.C.A. Corporation, USA.

LOQ 5: Heated Oils/Frying Oil Quality

(developed in conjunction with the AOCS Lipid Oxidation and Quality Division)

Room: Continental A

Chairpersons: Linda Malcolmson and Roman Przybylski, University of Manitoba, Canada.

8:15 **Opening Remarks**

8:20 **Effect of Frying on Tocopherols in Genetically Modified Oils.** L. Normand *(Honored Student Award Winner)*, R. Przybylski, M. Eskin, and L.J. Malcolmson, University of Manitoba, Canada.

8:40 **Stability of Sunflower Oils from U.S. and South Africa During Frying and Sensory Characteristics of Fried Doughnuts.** S.L. Melton, S.M. Siluala, and M.P. Penfield, University of Tennessee, USA.

9:00 **Evaluation of Quality Characteristics of Safflower–Groundnut Oil Blends During Deep-Fat Frying.** V.K. Tyagi, H.B. Technological Institute, India.

9:20 **Effects of Tocopherols and Sterols on the Oxidation of High-Oleic Triacylglycerols at Frying Temperatures.** Anna-Majia Lampi[a] and Afaf Kamal-Eldin[b], [a]Helsinki University, Finland; and [b]Swedish University of Agricultural Science, Sweden.

9:40 **Stabilization of Frying Oils with Novel Natural Compounds.** S.P. Kochhar, Good-Dry International N.V., England.

10:00 **Influence of the Triacylglycerol Structure and Composition upon Oligomers, *trans* Fatty Acids, and Cyclic Fatty Acid Monomers Formation During Heat Treatment.** J.C. Martin, M.C. Dobarganes, G. Marquez-Ruiz, W.W. Christie, F. Lavillonniere, M. Nour, and J.L. Sebedio, INRA, France.

PRO 5: New Technologies

(developed in conjunction with the AOCS Processing Division)

Room: International South

Chairpersons: S. Sefa Koseoglu, Texas A&M University, USA; and Taskin Tuglular, Unilever Turkey, Turkey.

8:15 **Opening Remarks**

8:20 **Methods for Conversion of Oil Refinery By-Products into Value-Added Products.** K. Kóvári[a], J. Denise[b], P. Polla[c], Z.S. Kemény[a], K. Recseg[a], and R. Filliéres[d], [a]Cereol Group Research and Development Centre, Hungary; [b]Cereol Group Technical Direction, France; [c]Novaol, Italy; and [d]Novaol France, France.

8:40 **Countercurrent Bleaching with Electrofiltration Technique.** P. Transfeld, ÖHMI, Germany.

9:00 **Chemical Reactions in Near-Critical Solutions: A Review of Applications in Edible Oil Processing.** Poul Møller, Poul Møller Consulting Ltd., Denmark.

9:20 **FRIOLEX—A Complete New Oil Recovery Process.** Steffen Hruschka and Jochen Hamatschek, Westfalia Separator AG, Germany.

9:40 **New Technologies in Oilseed Processing and Edible Oils Refining Industry: A Review.** S. Sefa Koseoglu, Texas A&M University, USA.

10:00 **Evaporation Technology for Pollution Abatement in Palm Oil Industry.** Ah Nagan Ma, Palm Oil Research Institute of Malaysia (PORIM), Malaysia.

10:20 **New Hydrogenation Process Technology Utilizing Up-Pumping Hydrofoil Impellers.** Eric Zinter, Paul Kubera, Priscilla Kaufman, and Ron Clements, Lightnin, USA.

10:40 **Refining Vegetable Oils by Near-Critical Extraction.** M. Drescher, B. Holm-Jensen, P. Möller, S. Peter*, and E. Weidner, Universität Erlangen-Nürnberg, Germany.

11:00 **New Techniques in Semicontinuous Deodorization.** Anthony Athanassiadis, consultant, Belgium.

11:20 **Increase Your Plant Profitability While Meeting Oilseed Processing Demands for a Growing World Population.** Willi Fetzer, Buhler, Inc., USA.

11:40 **Monitor and Control of Interesterification.** Linsen Liu and Dan Lampert, Cargill, Inc., USA.

12:00 **Degumming Revisited.** Albert J. Dijkstra, Belgium.

12:20 **Pervaporation Membranes for Batch Processes—Comparison of Ceramic, Zeolite and Polymeric Membranes.** F.P. Cuperus and R.W. van Gemert, Agrotechnological Research Institute (ATO-DLO), The Netherlands.

S&D 5: General Surfactants and Detergents II

(developed in conjunction with the AOCS Surfactants and Detergents Division)

Room: International North

Chairperson: Tim Swiatek, BASF Corp., USA.

8:15 **Opening Remarks**

8:20 **Relative Energies of Intermediates and Transition States Which May Be Involved in the α-Sulfonation of Fatty Methyl Esters with Sulfur Trioxide.** Marshall J. Nepras, Stepan Company, USA.

8:40 **Enhanced Propoxylation of Linear Alcohols.** Michael F. Cox, Upali Weerasooriya, Paul Filler, and William Mellors, CONDEA Vista Company, USA.

9:00 **Comparison of the Ability of Micelles and the Coacervate Phase Above the Cloud Point of Nonionic Surfactants to Solubilize Volatile Organic Compounds** Surat Sakulwongyai, John F. Scamehorn, Somcha Osuwan, and Sherril D. Christian, University o Oklahoma, USA.

9:20 **Influence of Molecular Structure of Nonionic Micelles on the Solubilization Kinetics in O/W Emulsions.** Jochen Weiss *(Honored Student Award Winner)*, Dason Brathwaite, and D.J. McClements, University of Massachusetts, USA.

De: pioch@messmpl.cirad.fr
A: KNOTHEGH@mail.ncaur.usda.gov
Objet: sorry

Hi Gary, I am so sorry, I went home by 7:30 last night since I had

to finish a file for asking money to the french ambassy in

Malaysia. It was not time to call my collegues then!

Althoug too late here are the informations :
(numbers refer to the previous email)

1/ Dr Zephirin Mouloungui,
Head of oleochemistry team
ENSCT-LCA-CATAT
118 route de Narbonne
31077 Toulouse Cedex4, France
tel (33) 561 17 57 27 fax """"57 30 ~~1~~catar@cict.fr

2/ Dr Daniel Pioch
Head of oleochemistry team
CIRAD
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tel (33) 567 61 58 82 fax """ 5515 pioch@cirad.fr

3/ Dr Salmiah Ahmad
Head of Advanced oleochemical technical center
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lot9-11 Jalan P/14
Seksyen 10
43650 Bandar Baru Bangi
Selangor Darul Ehsan, Malaysia
tel (60) 382 557 48 fax """"561 97

4/ Dr Sylvain Claude
Innovation and prospective studies division
SOFIPROTEOL
12 avenue Georges V
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tel (33) 140 69 48 08 fax (33) 147 23 02 88

5/ Dr Gerard Hillion
Division applied chemistry and physicochemistry
Institut Français du Pétrole
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92506 Rueil-Malmaison France
tel (33) 147 52 66 02 Fax "" "" ~~70 01~~
" 6055

6/ Mr Jean-Paul Gaouyer
Head of agroproducts non food uses division
ADEME
27 rue Louis Vicat
75015 Paris, France
tel (33) 147 65 21 58 fax """" 36 48 83 agrice@imaginet.fr

7/ Mr Xavier Pagès-Xatart-Parès
Head of chemistry and Invironment Department
ITERG
Parc Industriel-rue Monge
33600 Pessac France
tel (33) 556 36 00 44 fax """" 57 60

I do apologize once again

Daniel

ABSTRACT FORM

Due: January 9, 1998

89th AOCS
Annual Meeting
& Expo

May 10–13, 1998
Chicago Hilton and Towers
Chicago, Illinois, USA

Reference no. _____

Your phone number: 33.1.40.69.48.36 Your fax number: 33.1.47.23.02.88

Delivery time needed: ☒ 20 min ☐ 40 min ☒ Review paper ☒ Original research

Poster session: ☐ Yes ☒ No Your e-mail address: _____

Title:

Research of new outlets for glycerol –
Recent developments in France

Author(s):
(List principal author first; underline presenter's name if different from principal author.)

Sylvain CLAUDE

Company(ies)/Institution(s):

ONIDOL

Address(es):

12 Avenue George V
F – 75008 PARIS

Abstract:

As a general scheme, the valorisation of a raw material is optimised when secondary products are also exploited. The main secondary product of oleochemistry is glycerol, with a growing up contribution issued from biofuel outputs.

From that point of view, as France is engaged in a vast biofuel programme, the glycerol valorisation programme is therefore important. The topical question concerning glycerol valorisation subdivides as follow : on the one hand respectively to the kind of outlets existing at the present time. On the other hand, considering that glycerol chemistry and uses are well known since the last century, the question concerns the kind of researchs that deserve nevertheless to be implemented, in other words the kind of applications to explore.

Researchs have been implemented to find new applications for glycerol in the fields of polymers, surfactants, intermediaries. These potential outlets are examined from technical and economical points of view. The economical one is the most drastic, discarding applications that are technically worthwhile ; corn gluten feed displacement for instance. The remaining potential outlets, like the polyglycerols one, could develop intensively in the next future. However the markets concerned for the most applications would be niche markets.

Please check the AOCS Division that your paper relates to best:

- ☐ Surfactants and Detergents
- ☐ Biotechnology
- ☐ Health and Nutrition
- ☐ Processing
- ☐ Analytical
- ☒ Protein and Co-Products
- ☐ Edible Applications Technology
- ☐ Lipid Oxidation and Quality
- ☐ Phospholipid (ILPS)
- ☐ Feed Microscopy (AAFM)
- ☐ Ratite Oil
- ☐ Other

If intended for a specific session, please indicate the session title and/or chairperson's name:

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ABSTRACT FORM

Due: January 9, 1998

89th AOCS
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Your phone number: 33.1.4752 6288 Your fax number: 33.1.4752 7001

Delivery time needed: ☒ 20 min ☐ 40 min ☐ Review paper ☒ Original research

Poster session: ☐ Yes ☒ No Your e-mail address: _____

Title:

Alkylation or cooligomerisation of fatty acids or esters with ethylene.

Author(s):
(List principal author first; underline presenter's name if different from principal author.)

G. HILLION, D. BALLERINI, A. KOTOKO, R. STERN.

Company(ies)/Institution(s):

INSTITUT FRANCAIS DU PETROLE - 1&4 avenue de Bois-Préau

Address(es):

92852 RUEIL MALMAISON CEDEX - FRANCE

Abstract:

A new family of chemical compounds derived from fatty esters or acids with one or two branches of two carbon atoms on the linear carbon chain were produced.

These compounds after total hydrogenation of all olefinic groups showed following formulas :

$(C_2H_5)\ C_{17}H_{34}\ COOR$ (I) $(C_2H_5)_2\ C_{17}H_{33}\ COOR$ (II)

with R = H or alkyl group.

The branching of the ethyl group occurs between position 9 and 13 of the carbon chain.
These branched stearates may be synthetized by addition of ethylene at 2 to 3 Mpa pressure to diunsatured C18 fatty acids or esters originating in particular from vegetable oils as sunflower, linola, safflower or even soybean oil.

One very activ catalytic system contains anionic rhodium of the type $[Rh\ X_4]^-\ [Y\ R'_4]^+$ where X is preferably a halide ion ; Y is a nitrogen $N^{\oplus}$ or phosphorous $P^{\oplus}$ atom and R' is preferably a hydrocarbon group.

For example the catalyst is prepared by adding rhodium trichloride to a quaternary ammonium or phosphonium salt. After reaction the codimer is hydrogenated with known metallic catalyst.

The branched stearates (I) & (II) can be used as a base compound for lubricants with very low pour point, high oxidation stability, high viscosity index and good rheological properties.

This new raw material can also be used to produce emulsifying agents.

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- ☐ Processing
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- ☐ Protein and Co-Products
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- ☐ Other

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Reference no. _____

Your phone number: 33.1.47.65.21.58 Your fax number: 33.1.46.42.54.43

Delivery time needed: ☒ 20 min ☐ 40 min ☒ Review paper ☐ Original research

Poster session: ☐ Yes ☐ No Your e-mail address: jean-paul.gaouyer@ad

Title:

AGRICE : Research Activities in France in the area of Oil Chemistry

Author(s):
(List principal author first; underline presenter's name if different from principal author.)

Jean Paul GAOUYER

Company(ies)/Institution(s):

ADEME

Address(es):

27 rue Louis VICAT
F - 75 737 PARIS cedex 15

Abstract:

Following restriction of export markets, the french agriculture sector did have to diversify his outlets. Consequently, research activities were undertaken in the frame of AGRICE (Agriculture for Chemistry and Energy) created in 1994. AGRICE is a common scientific interest association gathering together all actors of the "filière" : agriculture professionals, chemistry and energy industrials, research organisations, public organisations.

Up to now, several research programmes supported by AGRICE have been concerned with the Oil-chemistry sector.

Concerning energy, programmes were devoted to reduce the global cost of biofuels production, in order to make biofuels competitive : new agronomic routes requiring less fertilizers and pesticides for rapeseed and sunflower, new industrial processes (trans-esterification...) and diversification of by-products outlets (glycerols, cakes...).

Concerning chemistry, research activities were targeted on various aspects : new agro-materials, as natural polymers (proteins, ...), molecules with surface-active properties (applications are in agro-chemistry, beauty care industry, ...), vegetal origin lubricants, drillings fluids.

These new fields of research should come to the development of new outlets for oleaginous.

Please check the AOCS Division that your paper relates to best:

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- ☐ Biotechnology
- ☐ Health and Nutrition
- ☐ Processing
- ☐ Analytical
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- ☐ Phospholipid (ILPS)
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- ☐ Ratite Oil
- ☐ Other

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Title : C=O / C=S exchange in the carboxylic part of triglycerides. Thiono derivatives as antiwear and extreme pressure additives in lubricants.

Authors : Z. MOULOUNGUI, V. EYCHENNE, A. GASET.

Institution : Laboratoire de Chimie Agroindustrielle, U.A. INRA n° 31A1010.

Adress : Ecole Nationale Supérieure de Chimie de Toulouse- INP de Toulouse

Laboratoire de Chimie Agroindustrielle, 118 route de Narbonne, 31077 Toulouse Cedex 4, FRANCE.

Abstract : Simple thionoesters and thionotriglycerides were obtained by a solvent-free reaction between fatty esters or vegetable oils and the Lawesson's reagent. This reagent allowes the specific exchange C=O in C=S in the carboxylic part of esters and triglycerides. The reaction occured with both type of esters in a lipidic layer. Molar ratio between fatty ester or vegetable oil and the Lawesson's reagent respectively of 1.2 and 3.6 and the temperature 140°C-170°C are deciding experimental parameters for the obtention of high yields in thionoesters and thionotriglycerides.

These high viscous compounds were caracterised by infrared spectroscopy and 1H and 13C NMR.

The results of the extreme-pressure four balls test, following the PSA D551136 norm, on crambe oil as standard and crambe oil with 6% of crambe thionotriglycerides showed that thionotriglycerides enhanced the antiwear properties of crambe oil and even the extreme-pressure properties of the oil. We could see that fail load with crambe oil was only 55 daN when it was 105 daN with 6% of crambe thionotriglycerides. We could also observed that under a load of 120 daN, the scar diameter was 2.4 mm with crambe oil and only 2.25 mm under a 170 daN load with 6% of thionotriglycerides in crambe oil.

In addition, these fatty thiono-organic compounds showed interesting antifongic activities. Thionoethyloleate gave 76 g/ml and 9 mg/ml as CI80 against two resistant stains of Candida Albicans.

In conclusion, fatty thionoesters and thionotriglycerides showed interesting potentialities as antiwear and extreme-pressure additives in lubricants with biostatic properties.

AOCS ANNUAL MEETING MAY, 1998
ABSTRACT OF TECHNICAL PAPER

THE MALAYSIAN OLEOCHEMICAL INDUSTRY : PRESENT STATUS AND FUTURE TRENDS

T.S. Tang, Salmiah Ahmad and Yusof Basiron, Palm Oil Research Institute of Malaysia, Bandar Baru Bangi, Malaysia

ABSTRACT

Since the establishment of the first oleochemical plant in 1981, Malaysia has evolved as one of the major producers of basic oleochemicals such as fatty acids, their methyl esters, fatty alcohols and glycerin. The first Industrial Master Plan (IMP, 1985-1995) has identified this sector as an important growth area. In 1995 the total production far exceeded the target. The abundant supply of palm and palm kernel oils, good infra-structure, availability of skilled technical personnel and conducive economic climate attractive to the transfer of technology have all contributed to this success.

Malaysian entrepreneurs have also embarked into downstreaming activities by investing into soap-noodle or soap-chip processing, metallic soaps and food esters. Further ventures into other derivatives for formulation of detergents, plasticisers, cosmetics, herbicides and lubricants and finally into these finished products are expected.

Research and development programs spearheaded by the Advanced Oleochemical Technology Centre (AOTC) of PORIM are designed to complement the progress in the industry. This is achieved by investigating into ways and means to further expand the applications of palm and palm kernel-based oleochemicals in the non-food areas, providing analytical services and also to study the biodegradability and eco-toxicity of these products. Breeding studies are also carried out to develop new planting materials with higher kernel content to help ease the heavy demand for palm kernel oil.

United States Department of Agriculture
Agricultural Research Service Midwest Area
National Center for Agricultural Utilization Research
1815 North University Street
Peoria, Illinois 61604-3999
Telephone: 309-681-6531
Fax: 309-681-6340

June 18, 1998

Dr. Daniel Pioch
CIRAD-CP
Laboratoire de Lipotechnie
BP 5035
34032 Montpellier Cedex 1
France

Dear Daniel,

Thank you for participating in our symposium on Alternative Diesel Fuels held on Monday, May 11, 1998 at the 89th AOCS Annual Meeting & Expo in Chicago, IL.

You work entitled "Precombustion Chemistry of Vegetable Oil-Based Biofuels" was part of a very well received symposium highlighting thoroughly the status of biodiesel research and development. Understanding the mechanisms that occur following injection and before combustion of the fuel will provide invaluable insight for improving exhaust emissions of biodiesel and other alternative fuels. Your work will allow significant progress to be made towards comprehension of these mechanisms.

This symposium was sponsored by the Industrial Oil Products Division (IOP), a newly formed division within AOCS that was putting together its first technical program. We are excited with the results and encourage your continued participation in IOP programs in the future.

Thanks again for your valuable contribution.

Sincerely,

Robert O. Dunn

Robert O. Dunn
Chemical Engineer
Oil Chemical Research

cc: OC File
G. Knothe

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Delivery time needed: ☒ 20 min ☐ 40 min ☐ Review paper ☒ Original research

Poster session: ☐ Yes ☒ No Your e-mail address: _____

Title:

Precombustional Chemistry of Vegetable Oil-Based Biofuels

Author(s):
(List principal author first; underline presenter's name if different from principal author.)

D. PIOCH [1], N. CHIRAT [1], P. LOZANO [1], J. GRAILLE [1], T.W. RYAN III [2], G. KNOTHE [3]

Company(ies)/Institution(s):

Address(es):

[1] CIRAD-CP, Lipotehchny Laboratory, BP5035, 34032 Montpellier Cedex, France
[2] Southwest Research Institute, Engine and Vehicle Research Division, San Antonio, TX 78284, USA
[3] National Center for Agricultural Utilization Research, Oil Chemical Research, USDA, Peoria, IL 61204, USA

Abstract:

Despite the differences between the chemical composition of standard diesel fuel and that of vegetable oils, the later are also suitable as engine fuels.
This led to investigate the effect of the precombustional chemistry of a vegetable-oil based biofuel. The work is based on injecting the fuel into a high-pressure, high-temperature combustion chamber. The gases are collected before ignition and analyzed by GC-MS.

This preliminary work allowed the identification of the main classes of compounds under various experimental conditions (temperature and pressure) both for biofuels and a diesel fuel and the comparison of physico-chemical properties of the products (ignition temperatures of individual compounds) to fuel properties.
Ignition delays are in the same range for triglycerides compared to the diesel fuel despite the great changes in the composition of the precombustion gases.

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- ☐ Surfactants and Detergents
- ☐ Biotechnology
- ☐ Health and Nutrition
- ☐ Processing
- ☐ Analytical
- ☐ Protein and Co-Products
- ☐ Edible Applications Technology
- ☐ Lipid Oxidation and Quality
- ☐ Phospholipid (ILPS)
- ☐ Feed Microscopy (AAFM)
- ☐ Ratite Oil
- ☐ Other

If intended for a specific session, please indicate the session title and/or chairperson's name:

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. WED 8.15
Reference no. # 6

Your phone number: (33)467615882 Your fax number: _____

Delivery time needed: ☒ 20 min ☐ 40 min ☐ Review paper ☒ Original research

Poster session: ☐ Yes ☒ No Your e-mail address: pioch@cirad.fr

Title:

Fatty Ketones : a New Way to Oleochemicals

Author(s):
(List principal author first; underline presenter's name if different from principal author.)

D. PIOCH [1], R. LESCURE [1], J. GRAILLE [1], TANG THIN SUE [2]

Company(ies)/Institution(s):

[1] Lipotechny Laboratory, CIRAD-CP, BP 5035, 34032 Montpellier Cedex, France

[2] Advanced Oleochemical Technical Center, PORIM, POB 10620, 50720 Kuala Lumpur, Malaysia

Address(es):

Abstract:

The increasing demand for more efficient oleochemicals requires a diversification of the industrial production. The ketonic path could contribute to this evolution.

The results reported show that bauxite is a suitable catalyst for ketone (R-CO-R) synthesis from fatty acids ($R\text{-}CO_2H$). Other products are water, carbon dioxide and also some hydrocarbons as by-products. Selectivity for ketones stays generally high even at very high conversion rates.

This process allowed the synthesis of series of saturated ketones from C11 to C31 including symmetrical or non symmetrical compounds such as methyl ketones. In addition to the ketones themselves, the "ketonic path" open the way to many unusual oleochemicals including "branched chain" oleochemicals (esters, amines, quats) which are well known for their unique properties compared to "straight chain" containing compounds. However the oleochemical industry manufactures mainly if not only compounds which belong to the second series.

Please check the AOCS Division that your paper relates to best:

- ☐ Surfactants and Detergents
- ☐ Biotechnology
- ☐ Health and Nutrition
- ☐ Processing
- ☐ Analytical
- ☐ Protein and Co-Products
- ☐ Edible Applications Technology
- ☐ Lipid Oxidation and Quality
- ☐ Phospholipid (ILPS)
- ☐ Feed Microscopy (AAFM)
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89th AOCS
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May 10–13, 1998
Chicago Hilton and Towers
Chicago, Illinois, USA

PROGRAM

AOCS

ice: U.S. $5.00

TOPIC AREA	Monday Morning 8:15 a.m.–12:00 noon	Monday Afternoon 1:55 p.m.–5:00 p.m.	Tuesday Morning 8:55 a.m.–12:00 noon
Analytical Room: Continental B	**ANA 1: Analysis of Conjugated Linoleic Acids (CLA) I** Chairpersons: R. Adlof, NCAUR, ARS, USDA, USA; M.P. Yurawecz, U.S. Food and Drug Administration, USA.	**ANA 2: Analysis of Conjugated Linoleic Acids (CLA) II** Chairpersons: R. Adlof, NCAUR, ARS, USDA, USA; M.P. Yurawecz, U.S. Food and Drug Administration, USA	**ANA 3: Analytical Chemistry in Oilseed Plant Breeding** Chairpersons: R. Scarth, University of Manitoba, Canada; K. Schulz, Zeneca Seeds, Canada; B. Gillespie, Pioneer Hi-Bred Production Ltd., Canada
Biotechnology Room: Marquette	**BIO 1: Value-Added Products from Vegetable Oils** Chairpersons: S.Z. Erhan and S.M. Erhan, NCAUR, ARS, USDA, USA.	**BIO 2: Advances in Genetic Modification of Soybean Oil** Chairpersons: R.F. Wilson, USDA, ARS, North Carolina State University, USA; D.F. Hildebrand, University of Kentucky, USA	**BIO 3: Biocatalysis I** Chairpersons: C.T. Hou, NCAUR, ARS, USDA, USA; R.N. Patel, Bristol Myers Squibb Co., USA
Edible Applications Technology Room: Joliet			**EAT 1: General Edible Applications Technology** Chairperson: M.E. Norris, Agricultural Utilization Research Institute, USA.
Feed Microscopy Room: Astoria	**FM 1: Bovine Spongioform Encephalopathy (BSE) I** Chairpersons: G. Falb, Buckeye Feed Mills, Inc., USA; C. Kennedy, Agro Pacific Industries Ltd., Canada.	**FM 2: Bovine Spongioform Encephalopathy (BSE) II** Chairpersons: K. Ranta, University of Kentucky, USA; L. Whitlock, Texas A&M University, USA.	**FM 3: What Is Feed Microscopy? Feed Microscopy Applications** Chairpersons: R. Manuel, University of Illinois, USA; G. Miller, Surfside Microscopy Lab, USA.
Health and Nutrition Room: Waldorf	**H&N 1: Lipid Absorption and Digest** Chairperson: A.B. Christophe, University Hospital Ghent, Belgium.	**H&N 2: PUFA and Eicosanoids in Cell Biology** Chairpersons: V.A. Ziboh, University of California, USA; R.B. Zurier, University of Massachusetts, USA.	
Industrial Oil Products Room: Williford A/B	**IOP 1: Synthesis of Novel Fatty Acid Derivatives** Chairpersons: J.T.P. Derksen, ATO-DLO, The Netherlands; G. Knothe, NCAUR, ARS, USDA, USA.	**IOP 2: Alternative Diesel Fuels** Chairpersons:vR.O. Dunn and G. Knothe, NCAUR, ARS, USDA, USA.	**IOP 3: New Industrial Uses for Soybean Oil I** Chairpersons: S. Knowlton, DuPont, USA; S.G. Wildes, OmniTech International, USA.
Lipid Oxidation and Quality Room: Continental A	**LOQ 1: Genetically Modified Oils: What's in the Future?** Chairpersons: K. Warner, NCAUR, ARS, USDA, USA; P.J. White, Iowa State University, USA.	**LOQ 2: Effects of Processing on Oil Quality** Chairpersons: M. Gupta, consultant, USA; M. Eskin, University of Manitoba, Canada.	**LOQ 3: Antioxidants in Food Stability and Health Management I** Chairpersons: O.I. Aruoma, University of London King's College, England; H.-J. Wille, Nestle R&D Centre, England.
Phospholipids Room: Boulevard A	**PHO 1: General Phospholipids** Chairpersons: W. van Nieuwenhuyzen, Eridania Beghin-Say, Belgium; W.C. Byrdwell, NCAUR, ARS, USDA, USA.	**PHO 2: Phospholipids and Atherosclerosis** Chairpersons: B.F. Szuhaj, Central Soya Company, Inc., USA; R.J. Nicolosi, University of Massachusetts–Lowell, USA.	
Processing Room: International South	**PRO 1: Introduction to Seed/Oil Trading and Risk Management** Chairperson: T. Kemper, French Oil Mill Machinery Co., USA.	**PRO 2: Roundtable on Environmental Plant Operations/ Environmental Compliance Issues** Chairperson: R.C. Edmondson, Applied Engineering Systems, Inc., USA.	**PRO 3: Processing Roundtable— Deodorization and Physical Refining** Chairperson: K. Carlson, RBD Technologies, USA.
Protein and Co-Products Room: Boulevard C	**PCP 1: New Industrial Products Based on Soy Protein** Chairpersons: D.J. Myers, Iowa State University, USA; M.P. Hojilla-Evangelista, NCAUR, ARS, USDA, USA; Organizer: B.J. Bremmer, Omni Tech International, USA.	**PCP 2: Protein Modifications** Chairperson: F.F. Shih and M.K. Dowd, SRRC, ARS, USDA.	**PCP 3: Phytochemicals in Protein and Co-Products** Chairpersons: C. Wang, South Dakota State University, USA; A. Mohamed, Virginia State University, USA.
Ratite Oil Room: Boulevard B	**RAT 1: Ratite Oils: Update on Processing and Properties** Chairpersons: E. Hernandez, Texas A&M University, USA; T. Fezler, AC Humko Corporation, USA.		
Surfactants and Detergents Room: International North	**S&D 1: Polymers in Detergents** Chairperson: M.S. Robertson, Rohm and Haas Co., USA.	**S&D 2: Bleach Technology for Laundry and Autodish** Chairperson: M.E. Burns, Procter & Gamble Company, USA.	**S&D 3: Cleaning of Hard Surfaces** Chairperson: D.S. Steichen, Akzo Nobel Chemicals, USA.

Tuesday Afternoon 1:55 p.m.–5:00 p.m.	Wednesday Morning 8:15 a.m.–12:00 noon	Wednesday Afternoon 1:55 p.m.–5:00 p.m.	POSTERS
ANA 4: SFC/SFE Chairpersons: J. Snyder and R. Holliday, NCAUR, ARS, USDA, USA	**ANA 5: General Analytical I** Chairperson: L. Myer, Leco Inc., USA	**ANA 6: General Analytical II** Chairperson: V.K.S. Shukla, Internation Food Science Centre AS, Denmark	**ANA-P: Analytical** Chairperson(s): K.A. Meyer, Kraft Foods Inc., USA.
BIO 4: Biocatalysis II Chairpersons: C.T. Hou, NCAUR, ARS, USDA, USA; C.C. Akoh, University of Georgia, USA	**BIO 5: Biosensor/General Biotechnology** Chairpersons: E. Tamiya, Japan Advanced Institute of Science and Technology, Japan; F. Mizutani, National Institute of Bioscience and Human Technology, MITI Institute, Japan	**BIO 6: General Biotechnology** Chairpersons: T.M. Kuo, NCAUR, ARS, USDA, USA; S. Simizu, Kyoto University, Japan	**BIO-P: Biotechnology** Chairperson: A.C. Lanser, NCAUR, ARS, USDA, USA.
EAT 2: Edible Applications of Modified Oils Chairpersons: E. Hernandez, Texas A&M University, USA; F.T. Orthoefer, Monsanto/Ceregen, USA.	**EAT 3: Modification of Butter Fat and Application** Chairpersons: J. Bumbalough and C. Luhman, Land O' Lakes Inc., USA.		**EAT-P: Edible Applications Technology** Chairperson: M. Sostrin, University of Arkansas, USA.
FM 4: Feed Microscopy Roundtable Discussion Chairperson: J.V. Makowski, Messiah College, USA.			
H&N 3: Framework for Dietary Recommended Intakes of Long Chain PUFA Chairpersons: I.S. Newton, Hoffmann LaRoche Inc., USA; M.M. Mathias, USDA, USA.	**H&N 4: General Health and Nutrition I** Chairperson: A.J. Sinclair, RMIT, Australia.	**H&N 5: General Health and Nutrition II** Chairpersons: M. Craig-Schmidt, Auburn University, USA; O. Angulo, Instituto Tecnológico de Veracruz, México.	**H&N-P: Health and Nutrition** Chairperson(s): B.D. Flickinger, University of Texas, USA.
IOP 4: New Industrial Uses for Soybean Oil II Chairpersons: D.E. Deyton and C. Sams, University of Tennessee, USA; Organizer: B.J. Bremmer, OmniTech International, USA.	**IOP 5: General Industrial Oil Products** Chairpersons: H. Frykman, NCAUR, ARS, USDA, USA; D. Pioch, CIRAD, France.		
LOQ 4: Antioxidants in Food Stability and Health Management II Chairpersons: O.I. Aruoma, University of London King's College, England; S. Cuppett, University of Nebraska-Lincoln, USA.	**LOQ 5: Heated Oils/Frying Oil Quality** Chairpersons: L. Malcolmson and R. Przybylski, University of Manitoba, Canada.	**LOQ 6: General Lipid Oxidation and Quality** Chairpersons: J.M. Hughes, Harvest States Honeymead Co., USA; A. Kamal-Eldin, Swedish University of Agricultural Science, Sweden.	**LOQ-P: Lipid Oxidation and Quality** Chairperson: A. Arora, University of Arizona, USA.
PHO 3: Phospholipids and Functional Foods Chairperson: M. Schneider, Lucas Meyer GmbH, Germany.			**PHO-P: Phospholipids** Chairperson: M. Sostrin, University of Arkansas, USA.
PRO 4: General Processing and Engineering Chairpersons: S. Doty, Alternative Sources, USA; J. Kirdelan, PSI Process Systems Inc., USA.	**PRO 5:New Technologies** Chairpersons: S.S. Koseoglu, Texas A&M University, USA; T. Tuglular, Unilever Turkey, Turkey.		**PRO-P: Processing** Chairperson: R. Narayanan, Ag Processing, Inc., USA.
PCP 4: General Protein and Co-Products Chairpersons: K. Liu, Hartz Seed/Monsanto, USA; W.L. Boatright, University of Kentucky, USA.	**TUESDAY MORNING • 8:15 a.m. –12:00 noon** **Exhibitor Session 1 (Ex 1): Processing/Refining Equipment** **Room: Boulevard A** **Exhibitor Session 2 (EX 2): Processing Chemicals/Additives/Ingredients** **Room: Boulevard B** **Exhibitor Session 3 (EX 3): Analytical Techniques/Instrumentation** **Room: Waldorf** **Exhibitor Session 4 (EX 4): Surfactants/Detergents/Soaps/Oleochemicals** **Room: Lake Ontario**		**PCP-P: Protein and Co-Products** Chairperson: Z. Nikolov, Iowa State University, USA.
S&D 4: General Surfactants and Detergents I Chairperson: T. Germain, Stepan Company, USA.	**S&D 5: General Surfactants and Detergents II** Chairperson: T. Swiatek, BASF, USA.	**S&D 6: General Surfactants and Detergents III** Chairperson: R. Franklin, Akzo Nobel Chemicals Inc., USA.	**S&D-P: Surfactants and Detergents** Chairperson: J.D. Seibold, Stepan Company, USA..

Nature Management and Fisheries

Agricultural Research Department
Agrotechnological Research Institute

CIRAD
Attn. Dr. Daniel Pioch
BP 5035
34032 Montpellier Cedex 1
FRANCE

ato-dlo

your letter of	your reference	our reference	date
		1088/hd/ib	27 May 1998
subject		direct line	enclosures
		+ 31.317.475013	1

Dear Daniël,

During our recent meeting in Chicago and Peoria, which I thought was very pleasant, you mentioned that it might be fruitful to explore how the interaction between CIRAD and ATO-DLO could be enhanced. After looking through your brochures and discussing this with people here at ATO I have come to the conclusion that indeed CIRAD and ATO-DLO have many common interests and are in various fields also complementary. It would, therefore, also in our opinion be very useful to get together and discuss in what fields we could reinforce each other and explore how we could start some joint research.

As a first step I have included with this letter our 1996 Annual Report for your information. I realize that this is a little outdated, but unfortunately our 1997 Annual Report will not be published before the end of June. However, as soon as it is available I will send you a copy of this also.

The next step might be that some broad areas of common interest are defined and that we meet either in Wageningen or in Montpellier to discuss in person how we should go further. This may be a meeting in which also the Director General of our Institute could be involved.

I am looking forward to your reaction.

Kind regards,

Hans Derksen

Dr. J.T.P. Derksen
Head of Division Renewable Materials and Industrial Products.

P.S.
I understand that Dr. Ruxton Villet of the USDA-ARS is presently also at your facility? If you see him say hello from me.

Agrotechnological Research Institute (ATO-DLO)
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ATO-DLO - Aims and scope

The Agrotechnological Research Institute ATO-DLO, founded in 1989, is an organisation for fundamental and applied-scientific research for agriculture and horticulture, trade and export and for the industries manufacturing food and non-food products on the basis of agro-raw materials.
The target of the institute's multidisciplinary research is to enhance the added value of agroproducts and to develop new technologies, applications and markets for agro-raw materials. In four key issues the institute covers the whole production and distribution column, from the primary raw material up to and including the half-finished and end-products.

Key issues

ATO-DLO's key issues are:

- Development of (non-food) industrial processing technologies and products, based on renewable agro-raw materials;
- Development of food processing technologies and products;
- Improvement of storage, transport, quality, food safety and integrated chain control of agricultural and horticultural produce;
- Development of system knowledge, logistics, decision support and artificial intelligence systems.

Disciplines

A vast range of research disciplines is integrated on the basis of programmes and project groups:

- (bio-)chemical and physical process technologies
- industrial microbiology
- biotechnology, cell and molecular biology, and molecular physics
- physiology and biophysics
- biochemistry and organic chemistry
- polymer chemistry and technology
- sensory analysis
- agrologistics and modelling
- technical engineering.

Research deals with many agro-raw materials from plants or animal origin, such as carbohydrates, fibres, fatty acids and proteins, including crops such as:

- **industrial crops**, including fibre hemp, flax, crucifers, Jerusalem artichoke, rape seed, crambe, cereals, potatoes, caraway;
- **vegetables**, including tomatoes, peppers, cucumbers, onions, cabbages;
- **fruits**, including apples, pears and exotics;
- **flowers and bulbs**, including gerbera, roses, carnations, orchids, tulips;
- **arable crops**, including potatoes, cereals, oil seed crops, beans.

Staff, facilities and equipment

ATO-DLO comprises a staff of over 550 research workers, including 220 scientists.
The institute's buildings house over 50 laboratories, 3 technology halls and 5 'Qualitrons' with a great variety of immunochemical/chemical, biophysical and molecular-physical facilities and equipment, including NMR, Confocal Laser Scanning Microscope, chlorophyll fluorescence, Photoacoustic Lasers, DSC, FTIR, GC-MS, X-ray diffraction and S(T)EM microscopes.
In addition, several pilot line facilities are available for processing (for food and non-food purposes), for the application of electro-magnetic energy techniques, for the production and testing of biodegradable and synthetic plastics (granules, films), for natural fibre production and processing, for modification of oils via artificial membranes and for supercritical CO_2 extraction of high-value natural plant compounds.

Contract research and consultancies

ATO-DLO is able to offer the following on a commercial basis:

- education and courses
- contract research
- consultancy services
- supply of products and services.

For the purpose of protecting client's interests, major parts of ATO-DLO's research are confidential.

Introduction

All key issues of ATO-DLO [fresh products; food & food processing; renewable agro materials (non-food); logistics & systems optimization] prospered very well in 1996. Contract research again extended significantly, just as the institute's participation in national and European research programmes, resulting in a further increase of the turnover by more than 35%.

As was expected, ATO-DLO's staff grew to approx. 550 persons, including 220 academic research workers coming from many Dutch and foreign universities. In 1996, more than 70 new staff positions were generated (and fullfilled) as a result of the extending research activities.
The average age of the staff members (30% female) is 33 years. Absence due to illness is as low as 3%. As in former years, spirit, creativity and productivity of the staff maintained their high levels.
The most significant change in the staff of ATO-DLO was the leave of director dr.ir. Albert H. Eenink, who assumed the position of Director Corporate Research of the multinational food company Nutricia, December 1996. Under his inspiring leadership, the Agrotechnological Research Institute, established in April 1989, expanded tremendously from year to year. ATO-DLO is indebted to him for his continuous and great efforts which gave the institute its current strong position on the national and international market for research and development.

Albert Eenink during his farewell word

The increasing R&D activities and the resulting growth of the institute's staff made it necessary to enlarge the accommodation of the institute. In addition to the erection of two semi-permanent buildings, plans were accomplished, end 1996, to build a new 'Technotron' close to the main building, which is going to house the institute's food processing research. This new accommodation will comprise 1300 m^2 of laboratories, 1600 m^2 of process technology halls and 600 m^2 of offices. The 'Technotron' is scheduled to be completed mid 1998.

Contract research now accounts for over 85% of ATO-DLO's turnover. Commercial contract partners of the institute are scattered over particularly Europe, with concentrations in Western Europe and Scandinavia, and to an increasing extent in the USA and South-East Asia. The fast growth of research contacts in South-East Asia has induced the institute to establish an office in the Indonesian city of Bogor.
In the Netherlands, the Ministry of Agriculture, Nature Management and Fisheries and the Ministry of Economic Affairs are very significant R&D-sponsoring partners for ATO-DLO and for the institute's clients.
Additionally, the European Commission supports a great variety of research projects where ATO-DLO is involved, both in food and non-food research areas.

In order to further optimize the equipment of laboratories, process technology halls and 'Qualitrons' for post-harvest research, investments were made for over Dfl. 5 million.

The output of the institute covered a broad area of results, activities and products, in-

cluding 15 patent applications. Examples are rapid and objective methods to predict the shelf life of fresh products; new storage systems for perishables; new process technologies for vegetable and animal raw materials; food and non-food products, including biopolymers; process control and logistic chain systems and new packaging concepts. Non-confidential R&D results were published in a broad range of international scientific journals or presented as posters and lectures (see pages 52-71). Members of the institute's staff attended many congresses, symposia, workshops, etc. and visited research partners all over the world.

Again, ATO-DLO was visited by many individuals and groups of guests from the Netherlands and from a lot of foreign countries, both for commercial reasons and for scientific and training purposes.

It is our expectation that the prosperous trends of the previous years will be continued in 1997.

The Annual Report 1996 comprises a concise review of the markets ATO-DLO is currently working for within the four key issues, giving also details of the capacities and potencies of the institute. Although a substantial part of ATO-DLO's R&D results is confidential due to agreements with contract partners, a few significant results are described, giving an impression of the institute's skills and expertises.

Dr. Henk J. Huizing
acting director

Affaire suivie par : Daniel Pioch
☎ 04 67 61 58 82
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Montpellier, June 15th 1998

Mr Steven Howell
MARC-IV Consulting, Inc.
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O/Ref. : PCBM/DP/ PM 32/98

Hi Steven,

I think your business in going fast as usual. I really appreciate meeting you last month in Chicago.

Following our discussions, please find hereafter the names and address of the men in charge for co-ordinating analysis and standard for Biodiesel in France :

F. STAAT and G. VERMEERSCH
SOFIPROTEOL
12 Avenue Georges V
F - 75008 PARIS - FRANCE
Tél (33) 1 40 69 48 08
Fax (33) 1 47 23 02 88

You will find enclosed also the copies of overheads for the papers I delivered at the AOCS meeting. Full text is not available but a copy of another paper is encluded.

In turn, I would ask you to send a copy of your paper "Recent developments in Commercializing Biodiesel in the US".

Yours sincerely.

Dr Daniel Pioch,
Head of Physico-Chemistry-Biofuel Group
CIRAD-AMIS / PAA / PCBM

MARC-IV Consulting, Inc.

Specializing in the Development of Industrial Products from Agriculture

DATE: June 2, 1998

TO: D. Ploch, CIRAD-CP

FROM: Alison Gebhardt, Assistant

RE: Fatty Ketones: A New Route to Oleochemicals

Steven Howell, MARC-IV Consulting, Inc., recently attended the 89th AOCS Annual Meeting and Expo in Chicago, Illinois. He found the paper you presented, Fatty Ketones: A New Route to Oleochemicals , during the General Industrial Oil Products session very informative and would like to have a copy of this paper or your overheards for his files.

It would be greatly appreciated if you would forward a copy of your paper or your overheads at your earliest convenience to:

Steven Howell
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16200 Northridge
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Fax: (816) 635-4836
email: showell@marciv.com

Thank you for your assistance in this matter.

If you would like a copy of Mr. Howell's presentation "Recent Developments in Commercializing Biodiesel in th United States", for which he received an outstanding paper presentation award at the AOCS seminar, please let us know and we will be happy to forward a copy to you.

vandemoortele

Dr. Danny VAN STEENKISTE
Central Technology Office Manager

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Paper on Fatty Ketones

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ANNEXE 2

COOPERATION AVEC L'USDA PEORIA

II-1 - Publication des résultats

II-2 - Présentation et activités du Centre de Recherche

II-3 - Coordonnées des personnes rencontrées

II-4 - Contacts avec le Consulat de France à Chicago

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Agricultural Research Service Midwest Area
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June 5, 1998

Dr. Daniel Pioch
CIRAD-CP
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Dear Daniel,

as discussed, enclosed please find a draft of our joint manuscript. I have added and modified some text and added some references as well as slightly modified the title. The Conclusions section still needs to be completed. In any case, please let me know your opinion and suggestions.

Best regards,

Gerhard Knothe

Gerhard Knothe

Phone: +1-309-681-6417
Fax: +1-309-681-6340
E-mail: knothegh@mail.ncaur.usda.gov

Enclosure

cc: OC File

Contribution to the Study of the Precombustion Chemistry of Vegetable Oil-Based Biofuels
I – Experiments on Precombustion of Some Vegetable Oils

N. Chirat[1], D. Pioch[1], P. Lozano[1], T.W. Ryan III[2], G. Knothe[3]

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3 Oil Chemical Research, National Center for Agricultural Utilization Research, Agricultural Research Service, US Department of Agriculture, Peoria, IL 61604, USA

Abstract

The precombustion of vegetable oils, specifically canola, coconut and palm oil, was studied in a constant volume combustion apparatus (CVCA) equipped with traps designed for collecting precombustion gases. The influence of deliberately added contaminants such as phospholipids as well as reaction parameters was studied. Various classes of compounds including straight-chain and branched alkanes, alkenes, alkylated aromatics, saturated and unsaturated aldehydes were observed. Although relevant literature data on the corresponding physical properties of some classes of compounds is sparse, the results were correlated with auto-ignition temperature and ignition delay time of the intermediate precombustion species. The objective is to establish connections between the composition of the gaseous phase prior to ignition (presence or lack of certain classes of compounds) and diesel fuel properties.

Keywords:
Biodiesel, vegetable oils, triglycerides, degradation, gas chromatography - mass spectrometry, precombustion chemistry.

National Center for Agricultural Utilization Research

U.S. Department of Agriculture
Agricultural Research Service
1815 N. University Street
Peoria, Illinois 61604-3999

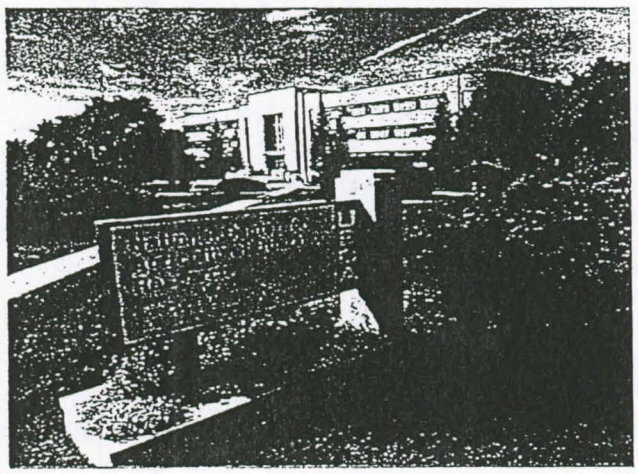
December 1996, Volume I

MISSION

As the in-house research arm of the USDA, the Agricultural Research Service develops new knowledge to solve agricultural problems of broad scope and high national priority. The activities of the Agency serve to meet the nutritional needs of the American consumer, sustain a viable food and agricultural economy and maintain a quality environment and natural resource base.

The **National Center for Agricultural Utilization Research** (NCAUR) invents new uses of agricultural commodities for industrial and food products, develops new technology to improve environmental quality and provides technical support to Federal regulatory and action agencies.

NCAUR is the largest of four ARS utilization centers with base funding of $23 million and 110 research scientists, 160 scientific support personnel, and 50 contract employees for operations and maintenance. The Center is the designated lead USDA Technology Transfer Facility dedicated to accelerated commercialization of research and technology.



HISTORY

Authorized by Congress in 1938 and opened in 1940, the Center was to develop new products made from agricultural commodities to provide market-driven assistance to America's farmers. The Center developed the fermentation technology used in the commercial production of penicillin and many other important antibiotics. Dextran, a polysaccharide, is widely used as a blood extender and xanthan gum is one of the most common thickening agents used in foods. Improvements in soybean oil quality have contributed to this important crop becoming the primary edible oil in the United States. Super Slurper is a water-collecting starch graft copolymer used in baby diapers, fuel filters and surgical dressings. Newer inventions include fluffy cellulose and oatrim. These products, modified from bran and other materials rich in dietary fiber are now being manufactured under USDA patent licenses and are found in many food products. NCAUR developments produce job and increase farm income.

RESEARCH PROGRAMS

NCAUR maintains a mixed portfolio of interdisciplinary science covering the fundamental to applied research continuum. This productive mixture creates ideas and solutions to technical problems identified during our industry interactions. Creative science coupled with practical experience allows for accelerated technology development. Technologies using microorganisms and/or their enzymes are being developed to transform raw agricultural materials (starch, proteins and oils) to commercially valuable products. New processing technologies including extrusion, jet cooking, high pressure reactions and supercritical extraction are also being used to make new value-added products. Novel biocontrol agents which function as environmentally friendly farming tools are being developed and commercialized. An integrated program involving modern biotechnology, sophisticated chemical analyses, and biological sciences is being directed to control mycotoxin producing fungi which decrease crop yields, pose potential health hazards and limit export opportunities for American crops in world trade.

NEW USES PROJECTS

Developing new uses for agricultural commodities will provide market-oriented benefit to the American farmer by increasing demand and providing opportunities for value-added conversions. Our program on industrial lubricants is a good example of NCAUR's approach to meeting its mission. To leverage government resources, we have established a Cooperative Research and Development Agreement or CRADA, with Caterpillar Inc. also located in Peoria, Illinois. The goal of this project is to develop a variety of environmentally friendly lubricants and functional fluids from renewable vegetable oils which can be used in their heavy machinery. Through this partnership, new uses for agricultural materials can be developed with built-in market pull , that is Caterpillar came to us with their specific needs, thus speeding the movement of technology from the laboratory to the marketplace.

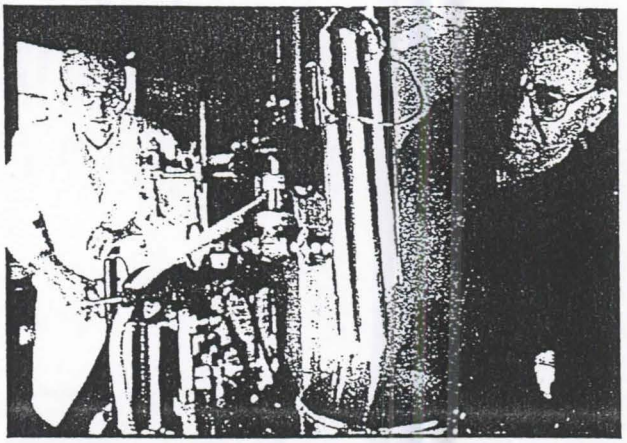
NCAUR scientists are developing improved technologies for bio-fuels. We are conducting fundamental chemical research on bio-diesel pre-ignition and ignition compounds which influence efficiency, emissions and economics. Progress is also being made on improving cold temperature performance of bio-diesel blends. In the area of fuel ethanol, microbes which convert more of the corn kernel to ethanol are being produced by genetic engineering. This enhancement to the fermentation process will increase the yield of a bushel of corn

Greater Peoria Transit bus runs on ethanol from corn.

by 0.3 gallons. This would mean a significant increase in revenues thus making ethanol more cost competitive.

Our 100% soy oil inks, in addition to being totally biodegradable, represent a tremendous potential market for our farmers. The current demand for all industrial uses of soy oil totals 300 million pounds. Our patented process for newspaper inks alone would increase demand for soy oil by an additional 500 million pounds. Ink formulations for magazines, books and other special printing needs are being patented at this time by our scientists. These uses represent an additional 500 million pounds of industrial uses. All applications will represent new markets for our farmers.

A new, non-separable starch/oil composite that mixes with water to form a stable emulsion has been developed and patented. Its fat mimicking properties coupled with its inherent emulsifying and encapsulating properties make it ideal for many commercial applications. Foods such as ice cream, salad dressings and processed meats have been prepared successfully under license agreement. Additional uses of the



Drs. Fanta and Eskins jet cooking a starch/oil composite.

composite for seed coatings for targeted herbicides, pesticides and biocontrol agents and as an industrial adhesive are being explored under cooperative research agreements with industry.

New materials for the cosmetics and lubricant industries based on NCAUR technologies using oil from the meadowfoam plant have created increased demand for farmers. In 1996, 2,300 acres of meadowfoam were harvested and more than 8,100 acres will be planted in 1997. This new crop provides an income for farmers in the U.S. Northwest who are impacted by new environmental regulations concerning the production of grass fields, the current major crop.

New processing technologies like extrusion, jet cooking, high pressure reactions and supercritical extraction are being used to make new, value-added products such as edible films, novel flavors and pigments, more nutritious edible oils and biodegradable plastics. All of these projects are conducted with industrial partners leveraging government resources and ensuring that technology moves to the marketplace as quickly as possible.

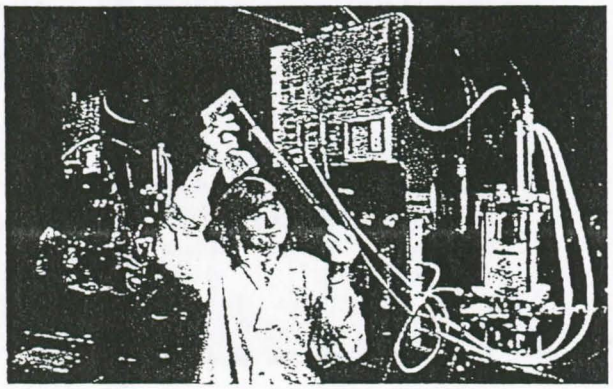
NEW FARMING TOOLS

Scientists at NCAUR are combining many scientific disciplines to develop technologies to help farmers produce crops in more environmentally friendly ways while remaining competitive in the world marketplace. Based on the work of our chemists, microbiologists, chemical engineers, entomologists and plant pathologists, integrated strategies for biocontrol are being developed for a variety of production systems. While located in the Midwest, NCAUR is a national research resource and Center scientists are developing technologies important to al areas of the country.

For example, a pheromone trap for monitoring pepper weevil has been developed and commercialized. This technolog permits more precise assessment of insect pest problems an allows southern pepper farmers to use limited amounts o chemical insecticides by better timing of applications

Northern potato farmers will benefit from a new control of dry rot. Current chemical control agents are no longer effective. NCAUR scientists have developed special bacteria which can be sprayed on the stored potatoes. Successful field trials have been completed in Idaho, and commercialization of the technology is currently underway.

Western fruit and vegetable farmers are served by a development in the use of a fungal agent for the biological control of white files. A method to mass produce and prepare



Dr. Slininger prepares test formulation for controlling dry rot on stored potatoes.

the fungus for control of this major pest has been developed by NCAUR scientists. Laboratory trials indicate that this is a very promising technology. Actual field trials are underway and commercial development has been initiated.

A molecular probe for the rapid detection of sudden death syndrome of soybeans has been developed. This significant plant disease results in $15 million losses in Illinois alone. The probe is now being used by plant breeders to develop varieties of soybeans resistant to the disease.

TECHNOLOGY TRANSFER

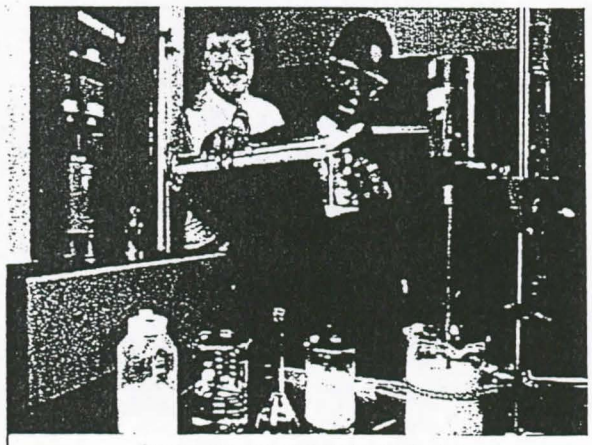
NCAUR continues to remain a leader in bringing research discoveries to the marketplace. In the past year, approximately 200 technical/scientific papers were published, 10 patent applications were filed and an additional 11 invention disclosures were prepared. The technologies developed by NCAUR scientists are eagerly sought by both large and small businesses. Six non-exclusive and one exclusive license for commercialization of NCAUR inventions have been granted in the past year. NCAUR currently participates in 17 Cooperative Research and Development Agreements (CRADA) with outside partners to enhance our research capability and facilitate commercialization of new technologies developed to increase agricultural commodity utilization. A variety of other types of agreements (Confidentially Agreements, Memorandums of Understanding, Trust Fund Projects, Specific Cooperative Agreements and other less formal agreements) provide a mechanism for Center scientists to work with others to solve high priority problems associated with American agriculture.

NCAUR serves a diverse customer base. Program objectives are continually fine-tuned through interactions with farmer commodity groups, environmental organizations, food and feed processing companies and governmental action agencies such as FGIS, FSIS and FDA. Scientists work with groups such as American Soybean Association, National Corn Growers Association, Institute of Shortening and Edible Oils, Canola Council of America, National Soy Diesel Development Board, National Association of Wheat Growers, American Corn Millers Federation, the Corn Refiners Association and many other national, state and local trade and industry associations. Recent research developments are communicated by participation in professional and technical meetings, special technical workshops, publication of technical articles and presentation of contributed and invited scientific talks. Patented technology is licensed to the private sector for implementation.

FUTURE

The creative scientists of NCAUR will continue to invent technologies which can provide market-driven assistance to American farmers and benefit the public. Yet new technology, however promising, must be proven through the process of scale-up from the laboratory to commercial scale implementation. Without this confidence-building experience, investors are reluctant to accept the risk of commercializing new technologies. For this reason, a modern pilot plant, to replace the original built in 1940, is critical for NCAUR to accomplish effective technology commercialization. A modernized facility will allow the Center and other ARS programs to provide access to emerging technologies, testing equipment and scientific expertise to the private sector.

A modular pilot plant for chemical and biological processing has been designed with four flexible bays for research and demonstration, along with laboratories for materials testing and evaluation. This modular design concept will provide flexible space for scale-up, proof-of-concept work and commercial demonstration of NCAUR technology. Through partnership agreements, the private sector will provide capital funds, manufacturing/production equipment, and technical support to commercialize specific ARS technologies. This approach will minimize the financial burden to the Federal Government and provide unique facilities, equipment, and expertise to the private sector. These partnerships will enhance technology commercialization through risk-sharing.



Steve Lyte mentors a student in the lab.

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NCAUR HOME PAGE
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- ACTIVITES DE RECHERCHE DU CENTRE DE PEORIA

Nouvelles plantes cultivées (New Crops)

Cette unité compte 26 personnes dont 13 chercheurs et 4 PhD.

Cette unité a constitué, depuis 38 ans, une collection de semences de plus de **15 000 espèces** de plantes en caractérisant les teneurs en huile et en protéine: banque de données disponible sur la toile: **www.ncaur.usda.govincinchome.**

Plusieurs plantes ont été identifiées comme pouvant présenter un intérêt économique, à la fois pour les huiles, les gommes, les protéines et les composants biologiquement actifs, pouvant servir à la production de détergents, cosmétiques, lubrifiants et médicaments.

Quelques nouvelles plantes indigènes aux Etats-Unis, identifiées comme pouvant présenter un intérêt économique, telles que:

Meadowfoam et **Estoiîne,** cultivées sur environ 10 000 acres; l'estoline est riche en acide gras en C28. **Milwweed** est une plante originaire du Nebraska à partir de laquelle on extrait une huile de bonne qualité qui contient des vitamines et des antioxydants. Une petite production commerciale s'est développée. **Sicklepod,** plante adventice du soja au sud des Etats-Unis, dont la graine contient des principes d'inhibition de croissance racinaire d'autres adventices et des éléments nutritionnels des vers de racine (army worm). Ces caractères peuvent être utilisés par des préparations mise en mélange dans le sol ou pour des additifs à des insecticides. **Euphorbia lagascae** produit une huile de qualité. Du **Jojoba** est extrait des concentrés de simmondsin, un agent "coupe-faim", à une échelle industrielle.

Plusieurs contrats d'exploitation des technologies d'extraction ont été cédés à **des** entreprises privées.

Polymères des plantes (Plant polymer)

L'objectif de cette unité de recherche est d'identifier les différents usages non-alimentaires des productions végétales et de mettre au point des technologies économiquement viables de ces produits dérivés.

La production de plastiques biodégradables à partir de l'amidon est le cas le plus courant de ces usages non-alimentaires. A partir d'une production de biopolymère les travaux portent sur la mise au point de produits, tels que les barquettes d'emballage d'aliments, de film plastiques, de services à usage unique etc.

Ces travaux font l'objet de plusieurs accords de partenariat avec l'industrie.

Qualité et Sécurité alimentaire (Food quelity end sofety)

En fait, les travaux portent sur les qualités nutritionnelles et le métabolisme des huiles alimentaires plus que sur la sécurité alimentaire proprement dite - Cf. Annexe Ili: programme de recherche 1996 et 1997.

Les recherches sont centrées sur le métabolisme humain global des huiles ingérées, notamment par l'utilisation de biomarqueurs constitués par les triglycérides. Les expérimentations étudient le devenir des produits gras dans le sang à différents stades après l'ingestion de produits oléagineux.

5 Les responsables des unités de recherche rencontrés ont remis une abondante quantité d'articles et de publications, notamment dans les secteurs des biopolymères, des biofuels et des produits obtenus à partir du maïs, ces articles et brochures sont disponibles au poste de Chicago.

Mycotoxines (Mycotoxin)

Les premiers travaux de l'unité de recherche ont porté sur les aflatoxines, et l'ARS a développé une expertise sur les toxines de *Fusarium monitiforme,* cancérigène du foie.
Des travaux sont conduits, avec la FDA, sur une toxine mise en évidence en Afdque du sud, en 1987.
Actuellement des études sont menées sur la flore et les toxines présentes sur les grains de maïs.
Il a été démontré que les grains cassés ou détériorés pouvaient être contaminés par ces toxines.
Une approche moléculaire sur les gènes producteurs de toxines peut permettre d'espérer un bio-contrôle.

Bio polymères (Biopolymer)

Cette unité étudie toutes les utilisations non-alimentaires autres que celles issues de l'amidon, à partir des interactions des polymères naturels, essentiellement les polysaccharides, avec des enzymes et des micro-organismes.
Les polymères recherchés doivent renforcer leur adaptation au marché national ou à l'exportation ou permettre d'ouvrir de nouveaux débouchés.
Quatre domaines d'application sont recherchés:

- Equivalent de la dextdne: Alteman, obtenu par fermentation de sucrose
- Production de biofuel,
- Production de détergents,
- Substitut de produits gras, par exemple le Z-Trim, cellulose extrait de l'avoine, servant de substitut des graisses pouvant être additionnes à des produits camés, ou encore l'Oatrim, une malodextdne substitut à faible taux de cholestérol qui peut être ajoutée à des produits laitiers. Cf. Annexe IV fiche sur le Z-Tdm et l'Oatdm

•

Propriétés chimiques des huiles végétales (011 Chemistry)

Sont étudiés les différents usages non alimentaires, possibles pour des huiles végétales, de soja et de maïs principalement:

- biodiesel,
- encre d'imphmerie,
- lubrifiants,
- colloïdes pour les colles ou les peintures.

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PLANT POLYMER RESEARCH UNIT

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RESEARCH PROGRAM

The Plant Polymer Research Unit conducts research on *polysaccharides and proteins* to develop new knowledge of and uses for agricultural commodities. Research emphasis is on chemical, physical, and biological modification, biopolymer-based composite materials, and structure-property relationships of the modified materials. Natural polymers are processed by various methods including extrusion, jet cooking, and drum drying. Additives and/or reagents are incorporated to modify properties to provide suitable materials for end-use applications. Chemical, physical, and biological techniques are used to characterize structure/property relationships, and provide a fundamental understanding of the impact of processing variables on these relationships. Specific applications include water-resistant starch-based foams, starch and protein based composites and blends for plastics applications, and adhesives.

CURRENT PROJECTS

Starch-based composites and blends - Use of starch in granular or thermoplastic form; morphology control via processing parameters and additives; preparation and characterization of films, foams, laminates, and molded articles

Biodegradable coatings and laminates - Maximize water resistance of starch-based materials; optimize adhesion between starch substrates and coatings

Protein and coproduct utilization - Identify and isolate useful proteinaceous materials from coproducts; develop novel processing methods for protein conversion; characterize structure/property relationships

Modification of natural polymers - Continuous processing of natural polymers; reactive extrusion; reduced environmental impact of chemical modification processes

Structure-property relationships - Characterize molecular, microscale, and macroscopic properties of natural polymers and blends; correlate properties with processing and properties; molecular modeling

FACILITIES

Extruders

Werner & Pfleiderer ZSK-30 corotating twin screw extruder with multiport injection, feeding, or venting capability (2)

Leistritz 18 mm corotating twin screw extruder with multiport injection or venting capability

Brabender PL-2000 torque rheometer with various single screw extruders (19 mm diameter)

Randcastle coextrusion system for extruding 3 or 5 layer film

Injection Molding

Cincinnati Milacron electric molding machine with 78 ton clamping force

Rabit small scale ram injection molder

Materials Characterization

DSC, NMR, SEM, TEM, DMA, GPC/SEC, static light scattering, X-ray diffraction, tensile and flexural properties, respirometer

USDA Research on Starch-Based Biodegradable Plastics* **

William M. Doane, Peoria, IL (USA)

Research on starch-based biodegradable plastics began in the 1970's and continues today at the National Center for Agricultural Utilization Research (NCAUR) in Peoria, IL. Technology has been developed for producing extrusion blown films and injection molded articles containing 50% and more of starch. Extrusion processing of compositions containing starch and other natural polymers to provide totally biodegradable plastics is being investigated. Starch grafted with thermoplastic side chains is under commercial development to provide injection molded items with a broad range of compositions and properties. The mechanism of biological degradation and the rate and extent of biodegradation of starch containing plastics in various environments is studied to enhance development and acceptance of biodegradable plastics.

USDA-Forschung über biologisch abbaubare Kunststoffe auf Stärkebasis. Die Forschung an auf Stärke basierenden Kunststoffen begann in den 70er Jahren und wird heute im National Center for Agricultural Utilization (NCAUR) in Peoria, IL, fortgesetzt. Es wurde eine Technologie zur Herstellung von extrusionsgeblasenen Filmen und spritzgeformten Gegenständen mit mehr als 50% Stärkegehalt entwickelt. Das Extrusionsverfahren mit Zusammensetzungen, die Stärke und andere natürliche Polymere enthalten, um total biologisch abbaubare Kunststoffe zu gewinnen, wird untersucht. Mit thermoplastischen Seitenketten gepfropfte Stärke befindet sich in wirtschaftlicher Entwicklung, um spritzgußgeformte Teile mit einem breiten Bereich an Zusammensetzungen und Eigenschaften zu erhalten. Der Mechanismus des biologischen Abbaues sowie Geschwindigkeit und Ausmaß des Bioabbaues stärkehaltiger Kunststoffe in verschiedenen Umgebungen wird untersucht, um die Entwicklung und die Akzeptanz biologisch abbaubarer Kunststoffe zu fördern.

1 Introduction

For twenty years researchers at the National Center For Agricultural Utilization Research (NCAUR), a research facility of the Agricultural Research Service, U.S. Department of Agriculture have been developing technology for making biodegradable plastics from starch [1, 2]. The body of knowledge developed over these years has been valuable as worldwide interest in biodegradable plastics surfaced in the 1980's, and plastics based on starch are now entering the market.

Efforts at NCAUR in the early seventies was directed mostly to starch poly(vinyl alcohol) (PVA) compositions that could be cast from aqueous dispersions and dried to flexible films [3]. Other additives such as crosslinking agents and plasticizers of various amounts and compositions were evaluated to enhance film properties. Films laminated with poly(vinyl chloride) or Saran were developed to reduce water-sensitivity as would be required for application of such films as agricultural mulch.

Somewhat later in the seventies *Otey* and coworkers researched films cast, milled or extrusion blown from compositions containing starch and poly(ethylene-co-acrylic acid) (EAA) [4, 5]. Films containing up to 60% starch exhibited good water resistance and were flexible without added plasticizers. Although not totally biodegradable due to the EAA, the films were useful as agricultural mulch and would deteriorate during the growing season into smaller segments. This work was expanded to include polyethylene (PE) in the formulation along with starch and EAA. Extrusion blown film containing 2–10% moisture of varying amounts of the three components was easily formed and exhibited acceptable properties for many applications. *Otey* and *Westhoff* received a patent in 1982 that disclosed technology for extrusion compounding and blowing of starch as a thermoplastic component in films at 5–10% moisture [6]. Today we witness a high level of activity from scientists throughout the world in company, academia and government laboratories expanding on these studies and developing new knowledge on the thermoplastic behavior of starch.

Research continues at NCAUR to more fully develop biodegradable plastics based on starch. Two basic approaches are being pursued. In one, blends of starch with other polymers, especially biodegradable ones, are being compounded and formed into films or injection molded into articles for evaluation. In a second approach, starches grafted with thermoplastic chains are being synthesized and formed into films or injected molded items. Cooperative agreements have been formed with companies interested in commercialization of starch-based biodegradable plastics to enhance development of commercially acceptable technology.

2 Compounding of Starch Formulations

Compounding of starch with other polymers and additives is most effectively accomplished by extrusion. We have employed both single and twin screw extrusion to obtain a uniform melt of the components. Typically, we extrude the compound as strands which are chopped into pellets for processing into extrusion-blown films or for injection molding. For compounding studies, composition of the mix is varied as are conditions in the extruder. Variation of moisture content, temperature profile, shear and residence time in the extruder are evaluated to determine their influence on extrudate properties.

Our earlier work with blends of starch and EAA, and starch-EAA-polyethylene (PE) now has led to the interesting discovery that starch forms an inclusion complex with EAA to help explain the partial miscibility between the two polymers [2]. Characterization of extrusion blown starch-EAA or starch-EAA-PE film by NMR, x-ray diffraction or by selective extraction indicated the presence of insoluble starch-EAA complex. In a typical preparation of starch-EAA-PE composite, starch is blended with powdered PE and EAA and an aqueous solution of urea and ammonium hydroxide. A typical formulation contains 40% starch, 25% EAA, 25%PE and 10% urea as the solid components. About eight parts of concentrated ammonium hydroxide per 100 parts of solids are added as plasticizer. The moist powder is extruded from a C. W. Brabender extruder through a strand die at temperatures of 120–180°C. The strands are chopped to produce pellets for extrusion as blown film or for

* Lecture presented at the 43rd Starch Convention at Detmold from April 28–30, 1992.

** The mention of firm names or trade products does not imply that they are endorsed or recommended by the U.S. Department of Agriculture over other firms or similar products not mentioned.

injection molding. We continue to study this inclusion complexing of starch with other polymers to better understand how this phenomenon could be useful for understanding and enhancing properties of starch-based plastics.

We continue to evaluate additives that can reduce the brittleness of starch compositons. Brittleness is caused by the relatively high glass transition temperature (Tg) and lack of a sub Tg main-chain relaxation. Brittleness also increases with time due to free volume relaxation and retrogradation. Although many plasticizers have been evaluated for enhancing flexibility of starch films, there is little data on the effect of plasticizer type and amount on starch Tg and crystallinity. Currently we are studying the effects of plasticizer type and level, humidity and time on the moisture content, and mechanical and structural properties of starch-urea-polyol ribbons. Combination of urea with certain polyols provides better plasticization of starch than either additive alone [7].

Although much of our research has been directed to extrusion of starch-synthetic polymer systems, mostly with non-biodegradable synthetic polymers, we are interested in the coextrusion of starch with biopolymers such as poly(hydroxy alkanoates), poly(lactic acid) and polycaprolactam. Also, we are interested in coextrusion of starch with other polysaccharides and with proteins. These types of mixed polymer systems offer the opportunity to develop totally biodegradable plastics.

3 Starch Graft Copolymers

Our research on starch graft copolymers has been ongoing for nearly thirty years and comprehensive reviews on these copolymers have been published [8, 9]. Early efforts were directed to starch graft polymers that were water-soluble or highly water dispersible. One such copolymer with the ability to absorb hundreds of times its weight in aqueous fluids has been produced commercially for fifteen years.

Graft polymers are prepared by first generating free radicals on starch and then allowing these free radicals to serve as macroinitiators for the vinyl or acrylic monomer. Generally, free radical initiated graft copolymers have high molecular weight branches that are infrequently spaced along the starch backbone. A number of free radical initiating systems have been used to prepare graft polymers, and these may be divided into two broad categories: chemical initiation (usually with ceric salts) and initiation by high energy irradiation, such as cobalt-60. The choice depends on the particular monomer to be polymerized. Graft polymerizations are usually run in water and can be carried out with either granular, unswollen starch or with starch that has been gelatinized by heating. Copolymers with hydrophobic grafts cannot be dispersed in water, but remain as insoluble solids, even after prolonged heating. Copolymers with water-soluble grafts, however, swell in water at room temperature and either dissolve or disperse to give smooth pastes when heated.

Starch graft copolymers having thermoplastic grafted branches, e.g., poly(methyl acrylate) (PMA) or polystyrene, are an important group of polymers that have potential for commercialization [10]. Technology for preparing these compositions has been patented [11] and commercialization is being pursued under a license. Starch-g-PMA is prepared by ceric-initiated graft polymerization of methyl acrylate onto either granular or gelatinized starch. The resulting graft copolymer typically contains about 50–60% PMA having a molecular mass of about 500,000; and conversion of monomer to polymer approaches 95%.

Since styrene does not graft copolymerize with starch in the presence of ceric ion, two alternative methods were used to prepare starch-g-polystyrene. In the first method, a small quantitiy of water is added to a mixture composed of equal weights of granular cornstarch and styrene, and the resulting paste is then irradiated with cobalt-60 to initiate polymerization. Polymerization does not take place if water is omitted from the reaction mixture. In the second method, potassium persulfate is used to initiate polymerization in a semi-solid mixture of starch, styrene, and water. Since weight% polystyrene in the graft copolymer prepared by this method was too low (28%) for processing into a continuous plastic, the copolymer was heated in dilute hydrochloric acid to hydrolyze and thus remove part of the starch component. The final product contained 58% polystyrene and could be easily processed.

Graft polymers are processed into plastic ribbons by extruding the powdery products through a laboratory model Brabender extruder. Extrusion conditions used for starch-g-PMA copolymers greatly influences extrudate properties. When granular starch is grafted with PMA and the starch-g-PMA is dry, extrusion temperatures of 150–160°C are required to form a smooth, translucent, leathery ribbon. At 125°C a poorly formed ribbon results.

When grafting of PMA is on gelatinized starch, ribbons with good properties are achieved at extrusion temperatures of 125–140°C without added moisture. Addition of 20% water allowed lowering the extrusion temperature below 100°C to obtain ribbons with good properties. Extruded ribbons had ultimate tensile strengths on the order of 2 500–3 000 psi (17.2–20.7 MPa).

Starch-g-PMA copolymers can also be extrusion blown to form continuous films. Copolymers used for this technology are prepared by the same method described earlier, except that starch is dissolved in hot water before the grafting reaction rather than merely being pasted or gelatinized. Since unmodified corn starch is difficult to dissolve and requires special techniques to attain solution and to avoid retrogradation, either derivatized or partially depolymerized starches have been used to prepare graft copolymers used for extrusion blowing. Soluble starch is necessary because grafting of PMA onto insoluble starch fragments leads to chunks of graft copolymer which are large enough to disrupt the integrity of a thin extrusion-blown film of polymer.

One derivatized starch that has worked well in both the graft polymerization and in the subsequent extrusion-blowing process is a commercial cationic waxy cornstarch with a D.S. of about 0.035. A graft copolymer containg 58% PMA onto this cationic starch gave film tensile strength in the 3 200–3 700 psi (22.1–25.5 MPa) range. For many extrusion experiments a solution of urea in water was mixed into the air-dried graft copolymer before extrusion. Urea and water act as plasticizers for starch, and urea also functions as a humectant to help keep water in the system at the temperature used for extrusion (about 95°C). If the polymer formulation becomes too dry, starch becomes too rigid for blowing, and a poor quality film is obtained. Film samples collected immediately after leaving the die contained about 10% water. Good quality films can also be obtained in the absence of urea; however, urea facilitates the blowing operation.

4 Biodegradation of Starch-Plastic-Materials

Imam and coworkers at NCAUR are among those studying the biodegradation of starch-plastics to produce a pool of information that will facilitate engineering starch-plastics with desired degradative properties [2]. Studies include both environmental degradation in fresh waters and degradation by isolated amylolytic bacteria and enzymes in the laboratory.

Amylolytic bacteria have been isolated from a wide variety of environments to study starch-plastic biodegradation. Bacteria have been selected for their ability to utilize starch as the sole carbon source in liquid culture media. In an effort to understand the mechanisms of microbial degradation of starch-containing plastics, several starch-hydrolyzing isolates have been examined for their degradative effect on starch plastics. One of these isolates, a consortia of bacteria designated as LD76, degraded up to 80% of the starch in starch-PE-EAA plastic films (originally 40% starch by weight) in 60 days in a liquid culture medium. The PE and EAA components of the film, however, remained largely non-degraded. The loss of starch from the film was accompanied by concomitant losses in weight and tensile strength of the films, which may have contributed to further degradation of the film by mechanical forces.

Laboratory studies with highly amylolytic *Arthrobacter* sp. revealed that in a liquid culture where starch-containing films were the sole carbon source, bacteria readily metabolized starch. Progressive removal of starch from the starch-PE-EAA film by the bacteria over 56 days of exposure was demonstrated by electron microscopy. It was noted that while the bacteria bonded significantly more densely to starch-g-PMA plastic film than to starch-EAA-PE film, starch was more readily hydrolyzed in starch-EAA-PE film. This suggests that adhesion of bacteria to the film is not an adequate indication of degradability of starch within the films.

The *Lactobacillus amylovorus* bacterium, isolated from corn waste fermentation, secreted amylase that rapidly degraded starch granules. Studies on microbial surface interactions between *L. amylovorus* and granular starch indicated that colonization by these bacteria on cornstarch granules was important in starch granule degradation.

That concentration of starch in plastics influences its availability to microbial attack has been demonstrated. Almost 40% by weight of starch (30% by volume) is required in formulations to assure interconnectivity of starch domains. At very low concentrations of starch, only surface starch would be acessible to direct attack by micro-organisms.

Rates and extents of starch removal from starch-plastic composites by several commercially available amylases were measured in cell-free systems. Amylases derived from animals, plants, and microbial sources all hydrolyzed starch rapidly. Pulverized starch-EAA-PE plastic from injection molded specimens was 40–60% hydrolyzed by these enzymes within several days.

A significant portion of the plastic films discarded into the environment can end up in aquatic ecosystems such as lakes, rivers, streams, ponds, and marshes. To learn the fate of starch-containing plastic films exposed to natural habitats, the effect of two fresh water ecosystems (pond and river) on starch-plastic films was studied. The data indicated that degradation of starch-plastic films exposed to natural aquatic environments con occur by a variety of mechanisms, including the combined effects of (a) biodegradation resulting from the enzymatic and microbial activities present in the aquatic environment and/or associated with the biofilm on the exposed surfaces, (b) bioinjestion or bio-consumption of the film by small organisms such as insects and insect larvae and, possibly, by (c) mechanical degradation resulting from disassociation of starch, EAA, and PE components of the film matrix. Although the starch portion of the plastic film was susceptible to environmental degradation, EAA and PE components of the plastic film remained essentially unaffected.

Verification of degradation of plastics in aqueous systems is a part of the worldwide effort to develop environmentally responsible packaging and delivery materials. Continued efforts may provide fully degradable starch-plastic materials that provide water resistance and strength properties suitable for many single use applications.

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Agricultural
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Food Quality and Safety Research - Progress Report for 1996 and Research Plans for 1997

National Center for
Agricultural Utilization
Research

Peoria, Illinois

MISSION STATEMENT

FOOD QUALITY AND SAFETY RESEARCH

New lipid-based human foods are developed from new oilseed varieties generated by ARS and private research programs employing selective breeding or genetic engineering. The quality and functionality of new food products, such as oxidative stability, flavor and odor stability, and stability at high temperature, are determined. Innovative technologies are applied to solve problems in the utilization of and to maintain and expand markets for vegetable oils. Stable-isotope labeled fats are used to elucidate the role of dietary fat in human nutrition and disease. High pressure techniques (supercritical fluid technology) are employed for commodity conversion and production of value-added materials from agricultural materials. Chemical and enzyme-based reactions are conducted in supercritical fluid medium for enhanced rates of reactions and to obtain unique compounds. Supercritical fluid technology is also applied to extract and analyze toxicants, such as pesticides, and nutrients from meats and food products.

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24 Jlt 98 19H21 pioch@cirad.cirad.fr

Received: from dfw-ix16.ix.netcom.com by cirad.cirad.fr with ESMTP
(1.37.109.16/16.2) id AA142376098; Wed, 29 Apr 1998 23:41:38 +0200
Return-Path: <fsm@ix.netcom.com>
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by dfw-ix16.ix.netcom.com (8.8.4/8.8.4)
id QAA05333 for <pioch@cirad.fr>; Wed, 29 Apr 1998 16:41:32 -0500 (CDT)
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(V1.3)
id rma005221; Wed Apr 29 16:40:41 1998
Message-Id: <35479FF6.422E@ix.netcom.com>
Date: 29 Avr 98 16:47
De: Bernard Charpentier <fsm@ix.netcom.com>
Reply-To: fsm@ix.netcom.com
Organization: French Consulate / Office of Science and Technology
X-Mailer: Mozilla 3.01 (Win95; I)
Mime-Version: 1.0
A: pioch@cirad.fr
Objet: Re: mission chicago
References: <199804291602.JAA13717@ixmail7.ix.netcom.com>
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X-Status: 0R00000000
Status: RO

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pioch@cirad.fr wrote:

> MESSAGE A L'ATTENTION DE MR BERNARD CHARPENTIER.
>
> Voic mes horaires de vol :
> Arrivée à chicago vol AF 54 le samedi 9 mai à 17h50 (terminal 5).
> départ pour Peoria en voiture le mercredi en soirée.
>
> Arrivée à chicago (depuis St Louis) vol TWA 106 dimanche 17 mai à 14h19 (terminal 2).
>
> Départ pour Paris dimanche 17 à 20h25.
>
> Merci de me preciser ta preference pour nous rencontrer:
> 1/ le samedi 9 à l'aeroport
> 2/ pendant le congres au Hilton
> 3/ le dimanche 17 à l'aeroport
>
> Ma preference est pour 1/ ou 3/ car pendant le congres je ne serai pas suffisamment
disponible moi-même.
>
> Bien amicalement
>
> Daniel Pioch

Bonjour,
Je suis désolé mais le samedi 9 je serai en visite à l'université de
Bloomington Indiana et ne serais de retour que le dimanche. Je ne sais
pas encore si je suis disponible le dimanche 17.
Je comoprend que durant le Congrés ce ne soit pas facile de
serencontrer, mais comme j'aimerais aussi pouvoir rencontrer les autres
participants français, ne serait-il pas possible de convenir d'un jour
et heure pour se voir. Ou autre solution de prévoir un soir pour un
diner avec "l'équipe" française.
Merci de me faire savoir la solution retenue pour prendre des
dispositions.
Merci
Bien amicalement
Bernard Charpentier

24 Jlt 98 19H22 pioch@cirad.cirad.fr

Received: from dfw-ix15.ix.netcom.com by cirad.cirad.fr with ESMTP
(1.37.109.16/16.2) id AA101684385; Tue, 14 Apr 1998 19:19:45 +0200
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(V1.3)
id rma011296; Tue Apr 14 11:39:27 1998
Message-Id: <353392E9.44F3@ix.netcom.com>
Date: 14 Avr 98 11:46
De: Bernard Charpentier <fsm@ix.netcom.com>
Reply-To: fsm@ix.netcom.com
Organization: French Consulate / Office of Science and Technology
X-Mailer: Mozilla 3.01 (Win95; I)
Mime-Version: 1.0
A: pioch@cirad.fr
Objet: Meeting a Chicago
References: <199802131056.CAA20489@ixmail4.ix.netcom.com>
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Content-Transfer-Encoding: 8bit
X-UIDL: 244283473bec41f5f78e14210c843272
X-Status: 0R00000000
Status: RO

Bonjour,
Je te confirme les termes de ma communication téléphonique de la semaine passée concernant la contribution financière de la mission scientifique aux Etats-Unis pour la participation au Congrès de Chicago.

Le soutien pour cette mission sera de 7000FF, pouvant correspondre à une prise en charge partielle du séjour.

Je reste à ta disposition pour tout complément d'information.
Merci de repréciser les dates exactes d'arrivée et de départ de Chicago ainsi qu'un aperçu du programme, notamment concernant le congrès. Je souhaiterais pouvoir te rencontrer à cette occasion ainsi que les autres participants français.
Bien cordialement

Bernard Charpentier
Attaché pour la science
et la technologie
Chicago.

Consulat Général de France à Chicago
Service pour la Science et la Technologie

Chicago le 23/05/97
FSM / BC N°

Bernard Charpentier
Scientific Attaché

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National Center for Agricultural Utilization Research, NCAUR[1]
USDA ARS[2]
Peoria, Illinois
Rencontres du 20/05/97

Ce centre de recherche de l'U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS), opérationnel depuis 1940 est situé à Peoria[3] au centre de l'Illinois, au coeur des larges plaines consacrées aux cultures du soja et du maïs.

Il constitue l'un des quatre plus importants centres de l'USDA-ARS, avec ceux implantés à Berkeley, Philadelphie et la Nouvelle Orléans.
La mission essentielle du NCAUR est de rechercher et de valoriser des **utilisations non alimentaires des produits agricoles**.

Cette visite s'est déroulée à l'occasion de la mission de M. Daniel Pioch, chercheur au **Cirad**[4] (département des cultures pérennes) qui conduit depuis 2 ans avec des chercheurs de l'USDA - ARS de Peoria, un projet conjoint de recherche sur les biodiesels à partir de différentes huiles végétales. Outre le directeur du centre et le responsable régional de l'USDA-ARS, il a été possible de rencontrer les responsables de six des unités de recherche sur les dix que compte le centre, ainsi qu'un technicien d'une société de service pour l'agriculture de précision - Cf. Annexe I liste des personnes rencontrées..

[1] Pour en savoir plus, consulter: **www.ncaur.usda.gov**
[2] **USDA - ARS** : Service de la recherche du ministère fédéral de l'agriculture.
[3] **Peoria** compte de nombreuses activités industrielles liées à l'agriculture, dont la Sté **Caterpillar**.
[4] **Cirad** Centre de coopération internationale en recherche agronomique pour le développement

AGENDA

FRENCH CONSULATE AND CIRAD SCIENTIFIC ORGANIZATION OF FRANCE

(Bernard Charpentier, Scientific Attache' of the Consulate General of France and Daniel Pioch of CIRAD of Montpellier, France)

05/20/97

11:00 a.m.	Arrive (Gary Knothe)
11:30 a.m.	Meet with Dr. Johnsen
1:00 - 1:30 p.m.	Oil Chemical Research (Gary Knothe)
1:30 - 2:00 p.m.	Jim Rowley (Midwest Soil Service)
2:00 - 2:30 p.m.	Dr. Hewings (Area Director)
2:30 - 3:00 p.m.	New Crops Research (Tom Abbott)
3:00 - 3:15 p.m.	Plant Polymer Research (J. L. Willett)
3:15 - 3:45 p.m.	Food Quality & Safety Research (Rich Adlof)
3:45 - 4:15 p.m.	Mycotoxin Research (Ron Plattner)
4:15 - 4:30 p.m.	Biopolymer Research (Tim Leathers)

Note: The meetings will take place in room 3056

REPUBLIQUE FRANCAISE

MINISTERE
DES
AFFAIRES ETRANGERES

CONSULAT GENERAL
DE FRANCE
A CHICAGO

SERVICE POUR LA
SCIENCE ET LA
TECHNOLOGIE

BORDEREAU D'ENVOI

No 152/

Ambassade de France à Washington
Monsieur Serge Plattard
Conseiller pour la Science et la Technologie

DESIGNATION DES PIECES	NOMBRE	OBSERVATIONS
A/SVisite au National Center for Agricultural Utilization Reaearch, NCAUR du 20/05/97./. cc M.Gérard Dumont Consul Général à Chicago M. Daniel Gagneux, Conseiller Commercial, Chicago Mme Aline Perrette, M. Régis LeFaucheur, PEE M. Patrice Grassart, FTPO, Chicago M.George Ucko, DATAR, Chicago M. Claude Chéreau,Conseiller Agricole ,Washington MAE/ST/1 M. Michel Ronis MENESR/DRIC M.François Mégard MAPA/DPE M. Olivier Fauriel - Hervé Durand MAPA/DGAL Mme Marion Guillou, M. E. Shoonejans MAPA/DGER M. Philippe Mangé INRA , M. J.P. Prunier - Prod. végétale INRA, M. Jean Razungle - DRI Paris Cirad M. J.P. Pugliese, M. H. Rouille d'Orfeuil, D. Pioch Mme Dominique Martin-Rovet, Washington Mme Monique Rivier, Houston M. J.L. Davrainville, San Francisco M. C. Delacampagne, Boston ADEME ITCF M. Charles Brette AGPB - M. Hervé LE STUM	1	Pour information./.

Chicago, le 6 juin 1997

Bernard Charpentier
Attaché pour la Science et la Technologie

37 North Michigan Avenue - Suite 1170 - Chicago Illinois 60611 - Téléphone (312) 642 7438 Télécopie (312) 642 5998